

# Glossary

**Aborted takeoff.** A takeoff that is terminated prematurely when it is determined that some condition exists that makes takeoff or further flight dangerous.

**Absolute pressure.** Pressure measured from zero pressure or a vacuum.

**Absolute pressure regulator.** A valve used in a pneumatic system at the pump inlet to regulate the compressor inlet air pressure to prevent excessive speed variation and/or overspeeding of the compressor.

**Absolute zero.** The point at which all molecular motion ceases. Absolute zero is  $-460^{\circ}\text{F}$  and  $-273^{\circ}\text{C}$ .

**Accumulator.** A hydraulic component that consists of two compartments separated by a movable component, such as a piston, diaphragm, or bladder. One compartment is filled with compressed air or nitrogen, and the other is filled with hydraulic fluid and is connected into the system pressure manifold. An accumulator allows an incompressible fluid to be stored under pressure by the force produced by a compressible fluid. Its primary purposes are to act as a shock absorber in the system, and to provide a source of additional hydraulic power when heavy demands are placed on the system.

**Actuator.** A fluid power device that changes fluid pressure into mechanical motion.

**ADC.** Air data computer.

**ADF.** Automatic direction finder.

**ADI.** Attitude director indicator.

**Advancing blade.** The blade on a helicopter rotor whose tip is moving in the same direction the helicopter is moving.

**Adverse yaw.** A condition of flight at the beginning of a turn in which the nose of an airplane momentarily yaws in the opposite direction from the direction in which the turn is to be made.

**Aerodynamic drag.** The total resistance to the movement of an object through the air. Aerodynamic drag is composed of both induced drag and parasite drag. See induced drag and parasite drag.

**Aerodynamic lift.** The force produced by air moving over a specially shaped surface called an airfoil. Aerodynamic lift acts in a direction perpendicular to the direction the air is moving.

**Aeroelastic tailoring.** The design of an aerodynamic surface whose strength and stiffness are matched to the aerodynamic loads that will be imposed upon it.

**Aeronautical Radio Incorporated (ARINC).** A corporation whose principal stockholders are the airlines. Its function is to operate certain communication links between airliners in flight and the airline ground facilities. ARINC also sets standards for communication equipment used by the airlines.

**Aging.** A change in the characteristics of a material with time. Certain aluminum alloys do not have their full strength when they are first removed from the quench bath after they have been heat-treated, but they gain this strength after a few days by the natural process of aging.

**Agonic line.** A line drawn on an aeronautical chart along which there is no angular difference between the magnetic and geographic north poles.

**Air carrier.** An organization or person involved in the business of transporting people or cargo by air for compensation or hire.

**Air-cycle cooling system.** A system for cooling the air in the cabin of a turbojet-powered aircraft. Compressor bleed air passes through two heat exchangers where it gives up some of its heat; then, it drives an expansion turbine where it loses still more of its heat energy as the turbine drives a compressor. When the air leaves the turbine, it expands and its pressure and temperature are both low.

**Aircraft communication addressing and reporting system (ACARS).** A two-way communication link between an airliner in flight and the airline's main ground facilities. Data is collected in the aircraft by digital sensors and is transmitted to the ground facilities. Replies from the ground may be printed out so the appropriate flight crewmember can have a hard copy of the response.

**Airfoil.** Any surface designed to obtain a useful reaction, or lift, from air passing over it.

**Airspeed indicator.** A flight instrument that measures the pressure differential between the pitot, or ram, air pressure, and the static pressure of the air surrounding the aircraft. This differential pressure is shown in units of miles per hour, knots, or kilometers per hour.

**Airworthiness Alert.** A notice sent by the FAA to certain interested maintenance personnel identifying problems with aircraft that have been gathered from Malfunction and Defect Reports. These problems are being studied at the time the Airworthiness Alert is issued but have not been fully evaluated by the time the material went to press.

**Airworthiness Directive (AD note).** A notice sent out by the FAA to the registered owner of an aircraft notifying him or her of an unsafe condition that has been found on the aircraft. Compliance with AD notes is mandatory.

**Alclad.** A registered trade name for clad aluminum alloy.

**Alodine.** The registered trade name for a popular conversion coating chemical used to produce a hard, airtight, oxide film on aluminum alloy for corrosion protection.

**Alphanumeric symbols.** Symbols made up of all of the letters in our alphabet, numerals, punctuation marks, and certain other special symbols.

**Alternator.** An electrical generator that produces alternating current. The popular DC alternator used on light aircraft produces three-phase AC in its stator windings. This AC is changed into DC by a six-diode, solid-state rectifier before it leaves the alternator.

**Altimeter setting.** The barometric pressure at a given location corrected to mean (average) sea level.

**Altitude engine.** A reciprocating engine whose rated sea-level takeoff power can be produced to an established higher altitude.

**Alumel.** An alloy of nickel, aluminum, manganese, and silicon that is the negative element in a thermocouple used to measure exhaust gas temperature.

**Ambient pressure.** The pressure of the air surrounding a person or an object.

**Ambient temperature.** The temperature of the air surrounding a person or an object.

**American wire gauge.** The system of measurement of wire size used in aircraft electrical systems.

**Amphibian.** An airplane with landing gear that allows it to operate from both water and land surfaces.

**Amplifier.** An electronic circuit in which a small change in voltage or current controls a much larger change in voltage or current.

**Analog electronics.** Electronics in which values change in a linear fashion. Output values vary in direct relationship to changes of input values.

**Analog-type indicator.** An electrical meter that indicates values by the amount a pointer moves across a graduated numerical scale.

**Aneroid.** The sensitive component in an altimeter or barometer that measures the absolute pressure of the air. The aneroid is a sealed, flat capsule made of thin corrugated disks of metal soldered together and evacuated by pumping all of the air out of it. Evacuating the aneroid allows it to expand or collapse as the air pressure on the outside changes.

**Angle of attack.** The acute angle formed between the chord line of an airfoil and the direction of the air that strikes the airfoil.

**Angle of attack indicator.** An instrument that measures the angle between the local airflow around the direction detector and the fuselage reference plane.

**Angle of incidence.** The acute angle formed between the chord line of an airfoil and the longitudinal axis of the aircraft on which it is mounted.

**Annual rings.** The rings that appear in the end of a log cut from a tree. The number of annual rings per inch gives an indication of the strength of the wood. The more rings there are and the closer they are together, the stronger the wood. The pattern of alternating light and dark rings is caused by the seasonal variations in the growth rate of the tree. A tree grows quickly in the spring and produces the light-colored, less dense rings. The slower growth during the summer, or latter part of the growing season, produces the dark-colored, denser rings.

**Annunciator panel.** A panel of warning lights in plain sight of the pilot. These lights are identified by the name of the system they represent and are usually covered with colored lenses to show the meaning of the condition they announce.

**Anodizing.** The electrolytic process in which a hard, airtight, oxide film is deposited on aluminum alloy for corrosion protection.

**Antenna.** A special device used with electronic communication and navigation systems to radiate and receive electromagnetic energy.

**Anti-icer system.** A system that prevents the formation of ice on an aircraft structure.

**Anti-icing additive.** A chemical added to the turbine-engine fuel used in some aircraft. This additive mixes with water that condenses from the fuel and lowers its freezing temperature so it will not freeze and block the fuel filters. It also acts as a biocidal agent and prevents the formation of microbial contamination in the tanks.

**Antidrag wire.** A structural wire inside a Pratt truss airplane wing between the spars. Antidrag wires run from the rear spar inboard, to the front spar at the next bay outboard. Antidrag wires oppose the forces that try to pull the wing forward.

**Antiservo tab.** A tab installed on the trailing edge of a stabilator to make it less sensitive. The tab automatically moves in the same direction as the stabilator to produce an aerodynamic force that tries to bring the surface back to a streamline position. This tab is also called an antibalance tab.

**Antiskid brake system.** An electrohydraulic system in an airplane's power brake system that senses the deceleration rate of every main landing gear wheel. If any wheel decelerates too rapidly, indicating an impending skid, pressure to that brake is released and the wheel stops decelerating. Pressure is then reapplied at a slightly lower value.

**Antitear strip.** Strips of aircraft fabric laid under the reinforcing tape before the fabric is stitched to an aircraft wing.

**Arbor press.** A press with either a mechanically or hydraulically operated ram used in a maintenance shop for a variety of pressing functions.

**Arcing.** Sparking between a commutator and brush or between switch contacts that is caused by induced current when a circuit is broken.

**Area.** The number of square units in a surface.

**Aspect ratio.** The ratio of the length, or span, of an airplane wing to its width, or chord. For a nonrectangular wing, the aspect ratio is found by dividing the square of the span of the wing by its area. Aspect Ratio =  $\text{span}^2 \div \text{area}$ .

**Asymmetrical airfoil.** An airfoil section that is not the same on both sides of the chord line.

**Asymmetrical lift.** A condition of uneven lift produced by the rotor when a helicopter is in forward flight. Asymmetrical lift is caused by the difference between the airspeed of the advancing blade and that of the retreating blade.

**Attenuate.** To weaken, or lessen the intensity of, an activity.

**Attitude indicator.** A gyroscopic flight instrument that gives the pilot an indication of the attitude of the aircraft relative to its pitch and roll axes. The attitude indicator in an autopilot is in the sensing system that detects deviation from a level-flight attitude.

**Augmenter tube.** A long, stainless steel tube around the discharge of the exhaust pipes of a reciprocating engine. Exhaust gases flow through the augmenter tube and produce a low pressure that pulls additional cooling air through the engine compartment. Heat may be taken from the augmenter tubes and directed through the leading edges of the wings for thermal anti-icing.

**Autoclave.** A pressure vessel inside of which air can be heated to a high temperature and pressure raised to a high value. Autoclaves are used in the composite manufacturing industry to apply heat and pressure for curing resins.

**Autogiro.** A heavier-than-air rotor-wing aircraft sustained in the air by rotors turned by aerodynamic forces rather than by engine power. When the name Autogiro is spelled with a capital A, it refers to a specific series of machines built by Juan de la Cierva or his successors.

**Autoignition system.** A system on a turbine engine that automatically energizes the igniters to provide a relight if the engine should flame out.

**Automatic adjuster.** A subsystem in an aircraft disk brake that compensates for disk or lining wear. Each time the brakes are applied, the automatic adjuster is reset for zero clearance, and when the brakes are released, the clearance between the disks or the disk and lining is returned to a preset value. A malfunctioning automatic adjuster in a multiple-disk brake can cause sluggish and jerky operation.

**Automatic flight control system (AFCS).** The full system of automatic flight control that includes the autopilot, flight director, horizontal situation indicator, air data sensors, and other avionics inputs.

**Automatic pilot (autopilot).** An automatic flight control device that controls an aircraft about one or more of its three axes. The primary purpose of an autopilot is to relieve the pilot of the control of the aircraft during long periods of flight, autorotation. Descent of a helicopter without the use of engine power. An aerodynamic force causes the rotors to rotate.

**Autosyn system.** A synchro system used in remote indicating instruments. The rotors in an Autosyn system are two-pole electromagnets, and the stators are delta-connected, three-phase, distributed-pole windings in the stator housings. The rotors in the transmitters and indicators are connected in parallel and are excited with 26-volt, 400-Hz AC. The rotor in the indicator follows the movement of the rotor in the transmitter.

**Auxiliary power unit (APU).** A small turbine or reciprocating engine that drives a generator, hydraulic pump, and air pump. The APU is installed in the aircraft and is used to supply electrical power, compressed air, and hydraulic pressure when the main engines are not running.

**Aviation snips.** Compound-action hand shears used for cutting sheet metal. Aviation snips come in sets of three. One pair cuts to the left, one pair cuts to the right, and the third pair of snips cuts straight.

**Aviator's oxygen.** Oxygen that has had almost all of the water and water vapor removed from it.

**Avionics.** The branch of technology that deals with the design, production, installation, use, and servicing of electronic equipment mounted in aircraft.

**Azimuth.** A horizontal angular distance, measured clockwise from a fixed reference direction to an object.

**Back course.** The reciprocal of the localizer course for an ILS (Instrument Landing System). When flying a back-course approach, the aircraft approaches the instrument runway from the end on which the localizer antennas are installed.

**Backhand welding.** Welding in which the torch is pointed away from the direction the weld is progressing.

**Backplate (brake component).** A floating plate on which the wheel cylinder and the brake shoes attach on an energizing-type brake.

**Backup ring.** A flat leather or Teflon ring installed in the groove in which an O-ring or T-seal is placed. The backup ring is on the side of the seal away from the pressure, and it prevents the pressure extruding the seal between the piston and the cylinder wall.

**Balance cable.** A cable in the aileron system of an airplane that connects to one side of each aileron. When the control wheel is rotated, a cable from the cockpit pulls one aileron down and relaxes the cable going to the other aileron. The balance cable pulls the other aileron up.

**Balance panel.** A flat panel hinged to the leading edge of some ailerons that produces a force which assists the pilot in holding the ailerons deflected. The balance panel divides a chamber ahead of the aileron in such a way that when the aileron is deflected downward, for example, air flowing over its top surface produces a low pressure that acts on the balance panel and causes it to apply an upward force to the aileron leading edge.

**Balance tab.** An adjustable tab mounted on the trailing edge of a control surface to produce a force that aids the pilot in moving the surface. The tab is automatically actuated in such a way it moves in the direction opposite to the direction the control surface on which it is mounted moves.

**Balanced actuator.** A linear hydraulic or pneumatic actuator that has the same area on each side of the piston.

**Banana oil.** Nitrocellulose dissolved in amyl acetate, so named because it smells like bananas.

**Bank (verb).** The act of rotating an aircraft about its longitudinal axis.

**Barometric scale.** A small window in the dial of a sensitive altimeter in which the pilot sets the barometric pressure level from which the altitude shown on the altimeter is measured. This window is sometimes called the "Kollsman" window. base. The electrode of a bipolar transistor between the emitter and the collector. Varying a small flow of electrons moving into or out of the base controls a much larger flow of electron between the emitter and the collector.

**Base.** The electrode of a bipolar transistor between the emitter and the collector. Varying a small flow of electrons moving into or out of the base controls a much larger flow of electrons between the emitter and the collector.

**Bead (tire component).** The high-strength carbon-steel wire bundles that give an aircraft tire its strength and stiffness where it mounts on the wheel.

**Bead seat area.** The flat surface on the inside of the rim of an aircraft wheel on which the bead of the tire seats.

**Bearing strength (sheet metal characteristic).** The amount of pull needed to cause a piece of sheet metal to tear at the points at which it is held together with rivets. The bearing strength of a material is affected by both its thickness and the diameter of the rivet.

**Beehive spring.** A hardened-steel, coil-spring retainer used to hold a rivet set in a pneumatic rivet gun. This spring gets its name from its shape. It screws onto the end of the rivet gun and allows the set to move back and forth, but prevents it being driven from the gun.

**Bend allowance.** The amount of material actually used to make a bend in a piece of sheet metal. Bend allowance depends upon the thickness of the metal and the radius of the bend, and is normally found in a bend allowance chart.

**Bend radius.** The radius of the inside of a bend.

**Bend tangent line.** A line made in a sheet metal layout that indicates the point at which the bend starts.

**Bernoulli's principle.** The basic principle that explains the relation between kinetic energy and potential energy in fluids that are in motion. When the total energy in a column of moving fluid remains constant, any increase in the kinetic energy of the fluid (its velocity) results in a corresponding decrease in its potential energy (its pressure).

**Bezel.** The rim that holds the glass cover in the case of an aircraft instrument.

**Bias-cut surface tape.** A fabric tape in which the threads run at an angle of 45° to the length of the tape. Bias-cut tape may be stretched around a compound curve such as a wing tip bow without wrinkling.

**Bilge area.** A low portion in an aircraft structure in which water and contaminants collect. The area under the cabin floorboards is normally called the bilge.

**Bipolar transistor.** A solid-state component in which the flow of current between its emitter and collector is controlled by a much smaller flow of current into or out of its base. Bipolar transistors may be of either the NPN or PNP type.

**BITE.** Built-in test equipment.

**Blade track.** The condition of a helicopter rotor in which each blade follows the exact same path as the blade ahead of it.

**Black box.** A term used for any portion of an electrical or electronic system that can be removed as a unit. A black box does not have to be a physical box.

**Bladder-type fuel cell.** A plastic-impregnated fabric bag supported in a portion of an aircraft structure so that it forms a cell in which fuel is carried.

**Bleeder.** A material such as glass cloth or mat that is placed over a composite lay-up to absorb the excess resin forced out of the ply fibers when pressure is applied.

**Bleeding dope.** Dope whose pigments are soluble in the solvents or thinners used in the finishing system. The color will bleed up through the finished coats.

**Bleeding of brakes.** The maintenance procedure of removing air entrapped in hydraulic fluid in the brakes. Fluid is bled from the brake system until fluid with no bubbles flows out.

**Blimp.** A cigar-shaped, nonrigid lighter-than-air flying machine.

**Blush.** A defect in a lacquer or dope finish caused by moisture condensing on the surface before the finish dries. If the humidity of the air is high, the evaporation of the solvents cools the air enough to cause the moisture to condense. The water condensed from the air mixes with the lacquer or dope and forms a dull, porous, chalky-looking finish called blush. A blushed finish is neither attractive nor protective.

**Bonding.** The process of electrically connecting all isolated components to the aircraft structure. Bonding provides a path for return current from electrical components, and a low-impedance path to ground to minimize static electrical charges. Shock-mounted components have bonding braids connected across the shock mounts.

**Boost pump.** An electrically driven centrifugal pump mounted in the bottom of the fuel tanks in large aircraft. Boost pumps provide a positive flow of fuel under pressure to the engine for starting and serve as an emergency backup in the event an engine-driven pump should fail. They are also used to transfer fuel from one tank to another and to pump fuel overboard when it is being dumped. Boost pumps prevent vapor locks by holding pressure on the fuel in the line to the engine-driven pump. Centrifugal boost pumps have a small agitator propeller on top of the impeller to force vapors from the fuel before it leaves the tank.

**Boundary layer.** The layer of air that flows next to an aerodynamic surface. Because of the design of the surface and local surface roughness, the boundary layer often has a random flow pattern, sometimes even flowing in a direction opposite to the direction of flight. A turbulent boundary layer causes a great deal of aerodynamic drag.

**Bourdon tube.** A pressure-indicating mechanism used in most oil pressure and hydraulic pressure gauges. It consists of a sealed, curved tube with an elliptical cross section. Pressure inside the tube tries to straighten it, and as it straightens, it moves a pointer across a calibrated dial. Bourdon-tube pressure gauges are used to measure temperature by measuring the vapor pressure in a sealed container of a volatile liquid, such as methyl chloride, whose vapor pressure varies directly with its temperature.

**Brazing.** A method of thermally joining metal parts by wetting the surface with a molten nonferrous alloy. When the molten material cools and solidifies, it holds the pieces together. Brazing materials melt at a temperature higher than 800 °F, but lower than the melting temperature of the metal on which they are used.

**British thermal unit (BTU).** The amount of heat energy needed to raise the temperature of one pound of pure water 1 °F.

**Bucking bar.** A heavy steel bar with smooth, hardened surfaces, or faces. The bucking bar is held against the end of the rivet shank when it is driven with a pneumatic rivet gun, and the shop head is formed against the bucking bar.

**Buffeting.** Turbulent movement of the air over an aerodynamic surface.

**Bulb angle.** An L-shaped metal extrusion having an enlarged, rounded edge that resembles a bulb on one of its legs.

**Bulkhead.** A structural partition that divides the fuselage of an aircraft into compartments, or bays.

**Bungee shock cord.** A cushioning material used with the nonshock absorbing landing gears installed on older aircraft. Bungee cord is made up of many small rubber bands encased in a loose-woven cotton braid.

**Burnish (verb).** To smooth the surface of metal that has been damaged by a deep scratch or gouge. The metal piled up at the edge of the damage is pushed back into the damage with a smooth, hard steel burnishing tool.

**Burr.** A sharp rough edge of a piece of metal left when the metal was sheared, punched, or drilled.

**Bus.** A point within an electrical system from which the individual circuits get their power.

**Buttock line.** A line used to locate a position to the right or left of the center line of an aircraft structure.

**Butyl.** Trade name for a synthetic rubber product made by the polymerization of isobutylene. Butyl withstands such potent chemicals as phosphate ester-base (Skydrol) hydraulic fluids.

**Cage (verb).** To lock the gimbals of a gyroscopic instrument so it will not be damaged by abrupt flight maneuvers or rough handling.

**Calendar month.** A measurement of time used by the FAA for inspection and certification purposes. One calendar month from a given day extends from that day until midnight of the last day of that month.

**Calender (fabric treatment).** To pass fabric through a series of heated rollers to give it a smooth shiny surface.

**Calibrated airspeed (CAS).** Indicated airspeed corrected for position error. See position error.

**Calorie.** The amount of heat energy needed to raise the temperature of one gram of pure water 1 °C.

**Canted rate gyro.** A rate gyro whose gimbal axis is tilted so it can sense rotation of the aircraft about its roll axis as well as its yaw axis.

**Camber (wheel alignment).** The amount the wheels of an aircraft are tilted, or inclined, from the vertical. If the top of the wheel tilts outward, the camber is positive. If the top of the wheel tilts inward, the camber is negative.

**Canard.** A horizontal control surface mounted ahead of the wing to provide longitudinal stability and control.

**Cantilever wing.** A wing that is supported by its internal structure and requires no external supports. The wing spars are built in such a way that they carry all the bending and torsional loads.

**Cap strip.** The main top and bottom members of a wing rib. The cap strips give the rib its aerodynamic shape.

**Capacitance-type fuel quantity measuring system.** A popular type of electronic fuel quantity indicating system that has no moving parts in the fuel tank. The tank units are cylindrical capacitors, called probes, mounted across the tank, from top to bottom. The dielectric between the plates of the probes is either fuel or the air above the fuel, and the capacitance of the probe varies with the amount of fuel in the tank. The indicator is a servo-type instrument driven by the amplified output of a capacitance bridge.

**Capillary tube.** A soft copper tube with a small inside diameter. The capillary tube used with vapor-pressure thermometer connects the temperature sensing bulb to the Bourdon tube. The capillary tube is protected from physical damage by enclosing it in a braided metal wire jacket.

**Carbon monoxide detector.** A packet of chemical crystals mounted in the aircraft cockpit or cabin where they are easily visible. The crystals change their color from yellow to green when they are exposed to carbon monoxide.

**Carbon-pile voltage regulator.** A type of voltage regulator used with high-output DC generators. Field current is controlled by varying the resistance of a stack of thin carbon disks. This resistance is varied by controlling the amount the stack is compressed by a spring whose force is opposed by the pull of an electromagnet. The electromagnet's strength is proportional to the generator's output voltage.

**Carburizing flame.** An oxyacetylene flame produced by an excess of acetylene. This flame is identified by a feather around the inner cone. A carburizing flame is also called a reducing flame.

**Carcass (tire component).** The layers of rubberized fabric that make up the body of an aircraft tire.

**Case pressure.** A low pressure that is maintained inside the case of a hydraulic pump. If a seal becomes damaged, hydraulic fluid will be forced out of the pump rather than allowing air to be drawn into the pump.

**Cathode-ray tube (CRT).** A display tube used for oscilloscopes and computer video displays. An electron gun emits a stream of electrons that is attracted to a positively charged inner surface of the face of the tube. Acceleration and focusing grids speed the movement of the electrons and shape the beam into a pinpoint size. Electrostatic or electromagnetic forces caused by deflection plates or coils move the beam over the face of the tube. The inside surface of the face of the tube is treated with a phosphor material that emits light when the beam of electrons strikes it.

**Cavitation.** A condition that exist in a hydraulic pump when there is not enough pressure in the reservoir to force fluid to the inlet of the pump. The pump picks up air instead of fluid.

**CDI.** Course deviation indicator.

**CDU.** Control display unit.

**Center of gravity.** The location on an aircraft about which the force of gravity is concentrated.

**Center of lift.** The location of the chord line of an airfoil at which all the lift forces produced by the airfoil are considered to be concentrated.

**Center of pressure.** The point on the chord line of an airfoil where all of the aerodynamic forces are considered to be concentrated.

**Centering cam.** A cam in the nose-gear shock strut that causes the piston to center when the strut fully extends. When the aircraft takes off and the strut extends, the wheel is straightened in its fore-and-aft position so it can be retracted into the wheel well.

**Charging stand (air conditioning service equipment).** A handy and compact arrangement of air conditioning servicing equipment. A charging stand contains a vacuum pump, a manifold gauge set, and a method of measuring and dispensing the refrigerant.

**Chatter.** A type of rapid vibration of a hydraulic pump caused by the pump taking in some air along with the hydraulic fluid.

**Check (wood defect).** Longitudinal cracks that extend across a log's annual rings.

**Check valve.** A hydraulic or pneumatic system component that allows full flow of fluid in one direction but blocks all flow in the opposite direction.

**Chemical oxygen candle system.** An oxygen system used for emergency or backup use. Solid blocks of material that release oxygen when they are burned are carried in special fireproof fixtures. When oxygen is needed, the candles are ignited with an integral igniter, and oxygen flows into the tubing leading to the masks.

**Chevron seal.** A form of one-way seal used in some fluid-power actuators. A chevron seal is made of a resilient material whose cross section is in the shape of the letter V. The pressure being sealed must be applied to the open side of the V.

**Chromel.** An alloy of nickel and chromium used as the positive element in a thermocouple for measuring exhaust gas temperature.

**Circle.** A closed plane figure with every point an equal distance from the center. A circle has the greatest area for its circumference of any enclosed shape.

**Circuit breaker.** An electrical component that automatically opens a circuit any time excessive current flows through it. A circuit breaker may be reset to restore the circuit after the fault causing the excessive current has been corrected.

**Clad aluminum.** A sheet of aluminum alloy that has a coating of pure aluminum rolled on one or both of its surfaces for corrosion protection.

**Clamp-on ammeter.** An electrical instrument used to measure current without opening the circuit through which it is flowing. The jaws of the ammeter are opened, slipped over the current-carrying wire, and then clamped shut. Current flowing through the wire produces a magnetic field which induces a voltage in the ammeter that is proportional to the amount of current.

**Cleco fastener.** A patented spring-type fastener used to hold metal sheets in position until they can be permanently riveted together.

**Close-quarter iron.** A small hand-held iron with an accurately calibrated thermostat. This iron is used for heat-shrinking polyester fabrics in areas that would be difficult to work with a large iron.

**Closed angle.** An angle formed in sheet metal that has been bent more than 90°.

**Closed assembly time.** The time elapsing between the assembly of glued joints and the application of pressure.

**Closed-center hydraulic system.** A hydraulic system in which the selector valves are installed in parallel with each other. When no unit is actuated, fluid circulates from the pump back to the reservoir without flowing through any of the selector valves.

**Closed-center selector valve.** A type of flow-control valve used to direct pressurized fluid into one side of an actuator, and at the same time, direct the return fluid from the other side of the actuator to the fluid reservoir. Closed-center selector valves are connected in parallel between the pressure manifold and the return manifold.

**Coaxial.** Rotating about the same axis. Coaxial rotors of a helicopter are mounted on concentric shafts in such a way that they turn in opposite directions to cancel torque.

**Coaxial cable.** A special type of electrical cable that consists of a central conductor held rigidly in the center of a braided outer conductor. Coaxial cable, commonly called coax, is used for attaching radio receivers and transmitters to their antenna.

**Coefficient of drag.** A dimensionless number used in the formula for determining induced drag as it relates to the angle of attack.

**Coefficient of lift.** A dimensionless number relating to the angle of attack used in the formula for determining aerodynamic lift.

**Coin dimpling.** A process of preparing a hole in sheet metal for flush riveting. A coining die is pressed into the rivet hole to form a sharp-edged depression into which the rivet head fits.

**Collective pitch control.** The helicopter control that changes the pitch of all of the rotor blades at the same time. Movement of the collective pitch control increases or decreases the lift produced by the entire rotor disk.

**Collodion.** Cellulose nitrate used as a film base for certain aircraft dopes.

**Combustion heater.** A type of cabin heater used in some aircraft. Gasoline from the aircraft fuel tanks is burned in the heater.

**Compass fluid.** A highly refined, water-clear petroleum product similar to kerosene. Compass fluid is used to dampen the oscillations of magnetic compasses.

**Compass rose.** A location on an airport where an aircraft can be taken to have its compasses “swung.” Lines are painted on the rose to mark the magnetic directions in 30° increments.



**Compass swinging.** A maintenance procedure that minimizes deviation error in a magnetic compass. The aircraft is aligned on a compass rose, and the compensating magnets in the compass case are adjusted so the compass card indicates the direction marked on the rose. After the deviation error is minimized on all headings, a compass correction card is completed and mounted on the instrument panel next to the compass.

**Compensated fuel pump.** A vane-type, engine-driven fuel pump that has a diaphragm connected to the pressure regulating valve. The chamber above the diaphragm is vented to the carburetor upper deck where it senses the pressure of the air as it enters the engine. The diaphragm allows the fuel pump to compensate for altitude changes and keeps the carburetor inlet fuel pressure a constant amount higher than the carburetor inlet air pressure.

**Compensator port (brake system component).** A small hole between a hydraulic brake master cylinder and the reservoir. When the brakes are released, this port is uncovered and the fluid in the master cylinder is vented to the reservoir. When the brake is applied, the master-cylinder piston covers the compensator port and allows pressure in the line to the brake to build up and apply the brakes. When the brake is released, the piston uncovers the compensator port. If any fluid has been lost from the brake, the reservoir will refill the master cylinder. A restricted compensator port will cause the brakes to drag or will cause them to be slow to release.

**Composite.** Something made up of different materials combined in such a way that the characteristics of the resulting material are different from those of any of the components.

**Compound curve.** A curve formed in more than one plane. The surface of a sphere is a compound curve.

**Compound gauge (air conditioning servicing equipment).** A pressure gauge used to measure the pressure in the low side of an air conditioning system. A compound gauge is calibrated from zero to 30 inches of mercury vacuum, and from zero to about 150-psi positive gauge pressure.

**Compressibility effect.** The sudden increase in the total drag of an airfoil in transonic flight caused by formation of shock waves on the surface.

**Compression failure.** A type of structural failure in wood caused by the application of too great a compressive load. A compression failure shows up as a faint line running at right angles to the grain of the wood.

**Compression strut.** A heavy structural member, often in the form of a steel tube, used to hold the spars of a Pratt truss airplane wing apart. A compression strut opposes the compressive loads between the spars arising from the tensile loads produced by the drag and antidrug wires.

**Compression wood.** A defect in wood that causes it to have a high specific gravity and the appearance of an excessive growth of summerwood. In most species, there is little difference between the color of the springwood and the summerwood. Any material containing compression wood is unsuited for aircraft structural use and must be rejected.

**Compressor (air conditioning system component).** The component in a vapor-cycle cooling system in which the low-pressure refrigerant vapors, after they leave the evaporator, are compressed to increase both their temperature and pressure before they pass into the condenser. Some compressors are driven by electric motors, others by hydraulic motors and, in the case of most light airplanes, are belt driven from the engine.

**Concave surface.** A surface that is curved inward. The outer edges are higher than the center.

**Condenser (air conditioning system component).** The component in a vapor-cycle cooling system in which the heat taken from the aircraft cabin is given up to the ambient air outside the aircraft.

**Conductor (electrical).** A material that allows electrons to move freely from one atom to another within the material.

**Coning angle.** The angle formed between the plane of rotation of a helicopter rotor blade when it is producing lift and a line perpendicular to the rotor shaft. The degree of the coning angle is determined by the relationship between the centrifugal force acting on the blades and the aerodynamic lift produced by the blades.

**Constant (mathematical).** A value used in a mathematical computation that is the same every time it is used. For example, the relationship between the length of the circumference of a circle and the length of its diameter is a constant, 3.1416. This constant is called by the Greek name of Pi ( $\pi$ ).

**Constant differential mode (cabin pressurization).** The mode of pressurization in which the cabin pressure is maintained a constant amount higher than the outside air pressure. The maximum differential pressure is determined by the structural strength of the aircraft cabin.

**Constant-displacement pump.** A fluid pump that moves a specific volume of fluid each time it rotates; the faster the pump turns, the more fluid it moves. Some form of pressure regulator or relief valve must be used with a constant-displacement pump when it is driven by an aircraft engine.

**Constant-speed drive (CSD).** A special drive system used to connect an alternating current generator to an aircraft engine. The drive holds the generator speed (and thus its frequency) constant as the engine speed varies.

**Constantan.** A copper-nickel alloy used as the negative lead of a thermocouple for measuring the cylinder head temperature of a reciprocating engine.

**Contactors (electrical component).** A remotely actuated, heavy-duty electrical switch. Contactors are used in an aircraft electrical system to connect the battery to the main bus.

**Continuity tester.** A troubleshooting tool that consists of a battery, a light bulb, and test leads. The test leads are connected to each end of the conductor under test, and if the bulb lights up, there is continuity. If it does not light up, the conductor is open.

**Continuous Airworthiness Inspection Program.** An inspection program that is part of a continuous airworthiness maintenance program approved for certain large airplanes (to which 14 CFR Part 125 is not applicable), turbojet multi-engine airplanes, turbopropeller-powered multi-engine airplanes, and turbine-powered rotorcraft.

**Continuous-duty solenoid.** A solenoid-type switch designed to be kept energized by current flowing through its coil for an indefinite period of time. The battery contactor in an aircraft electrical system is a continuous-duty solenoid. Current flows through its coil all the time the battery is connected to the electrical system.

**Continuous-flow oxygen system.** A type of oxygen system that allows a metered amount of oxygen to continuously flow into the mask. A rebreather-type mask is used with a continuous-flow system. The simplest form of continuous-flow oxygen system regulates the flow by a calibrated orifice in the outlet to the mask, but most systems use either a manual or automatic regulator to vary the pressure across the orifice proportional to the altitude being flown.

**Continuous-loop fire-detection system.** A fire-detection system that uses a continuous loop of two conductors separated with a thermistor-type insulation. Under normal temperature conditions, the thermistor material is an insulator; but if it is exposed to a fire, the thermistor changes into a conductor and completes the circuit between the two conductors, initiating a fire warning.

**Control horn.** The arm on a control surface to which the control cable or push-pull rod attaches to move the surface.

**Control stick.** The type of control device used in some airplanes. A vertical stick in the flight deck controls the ailerons by side-to-side movement and the elevators by fore-and-aft movement.

**Control yoke.** The movable column on which an airplane control wheel is mounted. The yoke may be moved in or out to actuate the elevators, and the control wheel may be rotated to actuate the ailerons.

**Controllability.** The characteristic of an aircraft that allows it to change its flight attitude in response to the pilot's movement of the flight deck controls.

**Conventional current.** An imaginary flow of electricity that is said to flow from the positive terminal of a power source, through the external circuit to its negative terminal. The arrowheads in semiconductor symbols point in the direction of conventional current flow.

**Converging duct.** A duct, or passage, whose cross-sectional area decreases in the direction of fluid flow.

**Conversion coating.** A chemical solution used to form an airtight oxide or phosphate film on the surface of aluminum or magnesium parts. The conversion coating prevents air from reaching the metal and keeps it from corroding.

**Convex surface.** A surface that is curved outward. The outer edges are lower than the center.

**Coriolis effect.** The change in rotor blade velocity to compensate for a change in the distance between the center of mass of the rotor blade and the axis rotation of the blade as the blades flap in flight.

**Cornice brake.** A large shop tool used to make straight bends across a sheet of metal. Cornice brakes are often called leaf brakes.

**Corrugated metal.** Sheets of metal that have been made more rigid by forming a series of parallel ridges or waves in its surface.

**Cotter pin.** A split metal pin used to safety a castellated or slotted nut on a bolt. The pin is passed through the hole in the shank of the bolt and the slots in the nut, and the ends of the pin are spread to prevent it backing out of the hole.

**Countersinking.** Preparation of a rivet hole for a flush rivet by beveling the edges of the holes with a cutter of the correct angle.

**Coverite surface thermometer.** A small surface-type bimetallic thermometer that calibrates the temperature of an iron used to heat-shrink polyester fabrics.

**Crabbing.** Pointing the nose of an aircraft into the wind to compensate for wind drift.

**Crazing.** A form of stress-caused damage that occurs in a transparent thermoplastic material. Crazing appears as a series of tiny, hair-like cracks just below the surface of the plastic.

**Critical Mach number.** The flight Mach number at which there is the first indication of supersonic airflow over any part of the aircraft structure.

**Cross coat.** A double coat of aircraft finishing material in which the second coat is sprayed at right angles to the first coat, before the solvents have evaporated from the first coat.

**Cross-feed valve (fuel system component).** A valve in a fuel system that allows any of the engines of a multi-engine aircraft to draw fuel from any fuel tank. Cross-feed systems are used to allow a multi-engine aircraft to maintain a balanced fuel condition.

**Cross-flow valve.** An automatic flow-control valve installed between the gear-up and gear-down lines of the landing gear of some large airplanes. When the landing gear is released from its uplocks, its weight causes it to fall faster than the hydraulic system can supply fluid to the gear-down side of the actuation cylinder. The cross-flow valve opens and directs fluid from the gear-up side into the gear-down side. This allows the gear to move down with a smooth motion.

**CRT.** Cathode-ray tube.

**Cryogenic liquid.** A liquid which boils at temperatures of less than about 110 °F (–163 °C) at normal atmospheric pressures.

**Cuno filter.** The registered trade name for a particular style of edge-type fluid filter. Cuno filters are made up of a stack of thin metal disks that are separated by thin scraper blades. Contaminants collect on the edge of the disks, and they are periodically scraped out and allowed to collect in the bottom of the filter case for future removal.

**Current.** A general term used for electrical flow. See conventional current.

**Current limiter.** An electrical component used to limit the amount of current a generator can produce. Some current limiters are a type of slow-blow fuse in the generator output. Other current limiters reduce the generator output voltage if the generator tries to put out more than its rated current.

**Cusp.** A pointed end.

**Cyclic pitch control.** The helicopter control that allows the pilot to change the pitch of the rotor blades individually, at a specific point in their rotation. The cyclic pitch control allows the pilot to tilt the plane of rotation of the rotor disk to change the direction of lift produced by the rotor.

**Dacron.** The registered trade name for a cloth woven from polyester fibers.

**Damped oscillation.** Oscillation whose amplitude decreases with time.

**Database.** A body of information that is available on any particular subject.

**Data bus.** A wire or group of wires that are used to move data within a computer system.

**Debooster valve.** A valve in a power brake system between the power brake control valve and the wheel cylinder. This valve lowers the pressure of the fluid going to the brake and increases its volume. A debooster valve increases the smoothness of brake application and aids in rapid release of the brakes.

**Decay.** The breakdown of the structure of wood fibers. Wood that shows any indication of decay must be rejected for use in aircraft structure.

**Decomposition.** The breakdown of the structure of wood fibers. Wood that shows any indication of decay must be rejected for use in aircraft structure.

**Deciduous.** A type of tree that sheds its foliage at the end of the growing season. Hardwoods come from deciduous trees.

**Dedicated computer.** A small digital computer, often built into an instrument or control device that contains a built-in program that causes it to perform a specific function.

**Deep-vacuum pump.** A vacuum pump capable of removing almost all of the air from a refrigeration system. A deep-vacuum pump can reduce the pressure inside the system to a few microns of pressure.

**Deflator cap.** A cap for a tire, strut, or accumulator air valve that, when screwed onto the valve, depresses the valve stem and allows the air to escape safely through a hole in the side of the cap.

**Deicer system.** A system that removes ice after it has formed on an aircraft.

**Delamination.** The separation of the layers of a laminated material.

**Delivery air duct check valve.** An isolation valve at the discharge side of the air turbine that prevents the loss of pressurization through a disengaged cabin air compressor.

**Delta airplane.** An airplane with a triangular-shaped wing. This wing has an extreme amount of sweepback on its leading edge, and a trailing edge that is almost perpendicular to the longitudinal axis of the airplane.

**Delta connection (electrical connection).** A method of connecting three electrical coils into a ring or, as they are drawn on a schematic diagram as a triangle, a delta (D).

**Denier.** A measure of the fineness of the yarns in a fabric.

**Density altitude.** The altitude in standard air at which the density is the same as that of the existing air.

**Density ratio ( $\sigma$ ).** The ratio of the density of the air at a given altitude to the density of the air at sea level under standard conditions.

**Derated (electrical specification).** Reduction in the rated voltage or current of an electrical component. Derating is done to extend the life or reliability of the device.

**Desiccant (air conditioning component).** A drying agent used in an air conditioning system to remove water from the refrigerant. A desiccant is made of silica-gel or some similar material.

**Detent.** A spring-loaded pin or tab that enters a hole or groove when the device to which it is attached is in a certain position. Detents are used on a fuel valve to provide a positive means of identifying the fully on and fully off position of the valve.

**Detonation.** An explosion, or uncontrolled burning of the fuel-air mixture inside the cylinder of a reciprocating engine. Detonation occurs when the pressure and the temperature inside the cylinder become higher than the critical pressure and temperature of the fuel. Detonation is often confused with preignition.

**Deviation error.** An error in a magnetic compass caused by localized magnetic fields in the aircraft. Deviation error, which is different on each heading, is compensated by the technician “swinging” the compass. A compass must be compensated so the deviation error on any heading is no greater than 10 degrees.

**Dewar bottle.** A vessel designed to hold liquefied gases. It has double walls with the space between being evacuated to prevent the transfer of heat. The surfaces in the vacuum area are made heat-reflective.

**Differential aileron travel.** Aileron movement in which the upward-moving aileron deflects a greater distance than the one moving downward. The up aileron produces parasite drag to counteract the induced drag caused by the down aileron. Differential aileron travel is used to counteract adverse yaw.

**Differential pressure.** The difference between two pressures. An airspeed indicator is a differential-pressure gauge. It measures the difference between static air pressure and pitot air pressure.

**Differential-voltage reverse-current cutout.** A type of reverse-current cutout switch used with heavy-duty electrical systems. This switch connects the generator to the electrical bus when the generator voltage is a specific amount higher than the battery voltage.

**Digital multimeter.** An electrical test instrument that can be used to measure voltage, current, and resistance. The indication is in the form of a liquid crystal display in discrete numbers.

**Dihedral.** The positive angle formed between the lateral axis of an airplane and a line that passes through the center of the wing or horizontal stabilizer. Dihedral increases the lateral stability of an airplane.

**Diluter-demand oxygen system.** A popular type of oxygen system in which the oxygen is metered to the mask, where it is diluted with cabin air by an airflow-metering aneroid assembly which regulates the amount of air allowed to dilute the oxygen on the basis of cabin altitude. The mixture of oxygen and air flows only when the wearer of the mask inhales. The percentage of oxygen in the air delivered to the mask is regulated, on the basis of altitude, by the regulator. A diluter-demand regulator has an emergency position which allows 100 percent oxygen to flow to the mask, by-passing the regulating mechanism.

**Dipole antenna.** A half wavelength, center-fed radio antenna. The length of each of the two arms is approximately one fourth of the wavelength of the center frequency for which the antenna is designed.

**Dirigible.** A large, cigar-shaped, rigid, lighter-than-air flying machine. Dirigibles are made of a rigid truss structure covered with fabric. Gas bags inside the structure contain the lifting gas, which is either helium or hydrogen.

**Disc area (helicopter specification).** The total area swept by the blades of a helicopter main rotor.

**Divergent oscillation.** Oscillation whose amplitude increases with time.

**Diverging duct.** A duct, or passage, whose cross-sectional area increases in the direction of fluid flow.

**DME.** Distance measuring equipment.

**Dope proofing.** The treatment of a structure to be covered with fabric to keep the solvents in the dope from softening the protective coating on the structure.

**Dope roping.** A condition of aircraft dope brushed onto a surface in such a way that it forms a stringy, uneven surface rather than flowing out smoothly.

**Double-acting actuator (hydraulic system component).** A linear actuator moved in both directions by fluid power.

**Double-acting hand pump (hydraulic system component).** A hand-operated fluid pump that moves fluid during both strokes of the pump handle.

**Doubler.** A piece of sheet metal used to strengthen and stiffen a repair in a sheet metal structure.

**Downtime.** Any time during which an aircraft is out of commission and unable to be operated.

**Downwash.** Air forced down by aerodynamic action below and behind the wing of an airplane or the rotor of a helicopter. Aerodynamic lift is produced when the air is deflected downward. The upward force on the aircraft is the same as the downward force on the air.

**Drag (helicopter rotor blade movement).** Fore-and-aft movement of the tip of a helicopter rotor blade in its plane of rotation.

**Dragging brakes.** Brakes that do not fully release when the brake pedal is released. The brakes are partially applied all the time, which causes excessive lining wear and heat.

**Drag wire.** A structural wire inside a Pratt truss airplane wing between the spars. Drag wires run from the front spar inboard, to the rear spar at the next bay outboard. Drag wires oppose the forces that try to drag the wing backward.

**Drill motor.** An electric or pneumatic motor that drives a chuck that holds a twist drill. The best drill motors produce high torque, and their speed can be controlled.

**Drip stick.** A fuel quantity indicator used to measure the fuel level in the tank when the aircraft is on the ground. The drip stick is pulled down from the bottom of the tank until fuel drips from its opened end. This indicates that the top of the gauge inside the tank is at the level of the fuel. Note the number of inches read on the outside of the gauge at the point it contacts the bottom of the tank, and use a drip stick table to convert this measurement into gallons of fuel in the tank.

**Dry air pump.** An engine-driven air pump which used carbon vanes. Dry pumps do not use any lubrication, and the vanes are extremely susceptible to damage from the solid airborne particles. These pumps must be operated with filters in their inlet so they will take in only filtered air.

**Dry ice.** Solidified carbon dioxide. Dry ice sublimates, or changes from a solid directly into a gas, at a temperature of  $-110^{\circ}\text{F}$  ( $-78.5^{\circ}\text{C}$ ).

**Dry rot.** Decomposition of wood fibers caused by fungi. Dry rot destroys all strength in the wood.

**Ductility.** The property of a material that allows it to be drawn into a thin section without breaking.

**Dummy load (electrical load).** A noninductive, high-power, 50-ohm resistor that can be connected to a transmission line in place of the antenna. The transmitter can be operated into the dummy load without transmitting any signal.

**Duralumin.** The name for the original alloy of aluminum, magnesium, manganese, and copper. Duralumin is the same as the modern 2017 aluminum alloy.

**Dutch roll.** An undesirable, low-amplitude coupled oscillation about both the yaw and roll axes that affects many swept wing airplanes. Dutch roll is minimized by the use of a yaw damper.

**Dutchman shears.** A common name for compound-action sheet metal shears.

**Dynamic pressure (q).** The pressure a moving fluid would have if it were stopped. Dynamic pressure is measured in pounds per square foot.

**Dynamic stability.** The stability that causes an aircraft to return to a condition of straight and level flight after it has been disturbed from this condition. When an aircraft is disturbed from the straight and level flight, its static stability starts it back in the correct direction; but it overshoots, and the corrective forces are applied in the opposite direction. The aircraft oscillates back and forth on both sides of the correct condition, with each oscillation smaller than the one before it. Dynamic stability is the decreasing of these restorative oscillations.

**EADI.** Electronic Attitude Director Indicator.

**ECAM.** Electronic Centralized Aircraft Monitor.

**Eccentric brushing.** A special bushing used between the rear spar of certain cantilever airplane wings and the wing attachment fitting on the fuselage. The portion of the bushing that fits through the hole in the spar is slightly offset from that which passes through the holes in the fitting. By rotating the bushing, the rear spar may be moved up or down to adjust the root incidence of the wing.

**Eddy current damping (electrical instrument damping).** Decreasing the amplitude of oscillations by the interaction of magnetic fields. In the case of a vertical-card magnetic compass, flux from the oscillating permanent magnet produces eddy currents in a damping disk or cup. The magnetic flux produced by the eddy currents opposes the flux from the permanent magnet and decreases the oscillations.

**Edge distance.** The distance between the center of a rivet hole and the edge of the sheet of metal.

**EFIS.** Electronic Flight Instrument System.

**EHSI.** Electronic Horizontal Situation Indicator.

**EICAS.** Engine Indicating and Crew Alerting System.

**Ejector.** A form of jet pump used to pick up a liquid and move it to another location. Ejectors are used to ensure that the compartment in which the boost pumps are mounted is kept full of fuel. Part of the fuel from the boost pump flowing through the ejector produces a low pressure that pulls fuel from the main tank and forces it into the boost pump sump area.

**Elastic limit.** The maximum amount of tensile load, in pounds per square inch, a material is able to withstand without being permanently deformed.

**Electromotive force (EMF).** The force that causes electrons to move from one atom to another within an electrical circuit. Electromotive force is an electrical pressure, and it is measured in volts.

**Electron current.** The actual flow of electrons in a circuit. Electrons flow from the negative terminal of a power source through the external circuit to its positive terminal. The arrowheads in semiconductor symbols point in the direction opposite to the flow of electron current.

**ELT (emergency locator transmitter).** A self-contained radio transmitter that automatically begins transmitting on the emergency frequencies any time it is triggered by a severe impact parallel to the longitudinal axis of the aircraft.

**Elevator downspring.** A spring in the elevator control system that produces a mechanical force that tries to lower the elevator. In normal flight, this spring force is overcome by the aerodynamic force from the elevator trim tab. But in slow flight with an aft CG position, the trim tab loses its effectiveness and the downspring lowers the nose to prevent a stall.

**Elevons.** Movable control surfaces on the trailing edge of a delta wing or a flying wing airplane. These surfaces operate together to serve as elevators, and differentially to act as ailerons.

**EMI.** Electromagnetic interference.

**Empennage.** The tail section of an airplane.

**Enamel.** A type of finishing material that flows out to form a smooth surface. Enamel is usually made of a pigment suspended in some form of resin. When the resin cures, it leaves a smooth, glossy protective surface.

**Energizing brake.** A brake that uses the momentum of the aircraft to increase its effectiveness by wedging the shoe against the brake drum. Energizing brakes are also called servo brakes. A single-servo brake is energizing only when moving in the forward direction, and a duo-servo brake is energizing when the aircraft is moving either forward or backward.

**Epoxy.** A flexible, thermosetting resin that is made by polymerization of an epoxide. Epoxy has wide application as a matrix for composite materials and as an adhesive that bonds many different types of materials. It is noted for its durability and its chemical resistance.

**Equalizing resistor.** A large resistor in the ground circuit of a heavy-duty aircraft generator through which all of the generator output current flows. The voltage drop across this resistor is used to produce the current in the paralleling circuit that forces the generators to share the electrical load equally.

**Ethylene dibromide.** A chemical compound added to aviation gasoline to convert some of the deposits left by the tetraethyl lead into lead bromides. These bromides are volatile and will pass out of the engine with the exhaust gases.

**Ethylene glycol.** A form of alcohol used as a coolant for liquid-cooled engines and as an anti-icing agent.

**Eutectic material.** An alloy or solution that has the lowest possible melting point.

**Evacuation (air conditioning servicing procedure).** A procedure in servicing vapor-cycle cooling systems. A vacuum pump removes all the air from the system. Evacuation removes all traces of water vapor that could condense out, freeze, and block the system.

**Evaporator (air conditioning component).** The component in a vapor-cycle cooling system in which heat from the aircraft cabin is absorbed into the refrigerant. As the heat is absorbed, the refrigerant evaporates, or changes from a liquid into a vapor. The function of the evaporator is to lower the cabin air temperature.

**Expander-tube brake.** A brake that uses hydraulic fluid inside a synthetic rubber tube around the brake hub to force rectangular blocks of brake-lining material against the rotating brake drum. Friction between the brake drum and the lining material slows the aircraft.

**Expansion wave.** The change in pressure and velocity of a supersonic flow of air as it passes over a surface which drops away from the flow. As the surface drops away, the air tries to follow it. In changing its direction, the air speeds up to a higher supersonic velocity and its static pressure decreases. There is no change in the total energy as the air passes through an expansion wave, and so there is no sound as there is when air passes through a shock wave.

**Extruded angle.** A structural angle formed by passing metal heated to its plastic state through specially shaped dies.

**FAA Form 337.** The FAA form that must be filled in and submitted to the FAA when a major repair or major alteration has been completed.

**Federal Aviation Administration Flight Standards District Office (FAA FSDO).** An FAA field office serving an assigned geographical area staffed with Flight Standards personnel who serve the aviation industry and the general public on matters relating to certification and operation of air carrier and general aviation aircraft.

**Fading of brakes.** The decrease in the amount of braking action that occurs with some types of brakes that are applied for a long period of time. True fading occurs with overheated drum-type brakes. As the drum is heated, it expands in a bell-mouthed fashion. This decreases the amount of drum in contact with the brake shoes and decreases the braking action. A condition similar to brake fading occurs when there is an internal leak in the brake master cylinder. The brakes are applied, but as the pedal is held down, fluid leaks past the piston, and the brakes slowly release.

**Fairing.** A part of a structure whose primary purpose is to produce a smooth surface or a smooth junction where two surfaces join.

**Fairlead.** A plastic or wooden guide used to prevent a steel control cable rubbing against an aircraft structure.

**FCC.** Federal Communications Commission.

**FCC.** Flight Control Computer.

**Feather (helicopter rotor blade movement).** Rotation of a helicopter rotor blade about its pitch-change axis.

**Ferrous metal.** Any metal that contains iron and has magnetic characteristics.

**Fiber stop nut.** A form of a self-locking nut that has a fiber insert crimped into a recess above the threads. The hole in the insert is slightly smaller than the minor diameter of the threads. When the nut is screwed down over the bolt threads, the opposition caused by the fiber insert produces a force that prevents vibration loosening the nut.

**File.** A hand-held cutting tool used to remove a small amount of metal with each stroke.

**Fill threads.** Threads in a piece of fabric that run across the width of the fabric, interweaving with the warp threads. Fill threads are often called woof, or weft, threads.

**Fillet.** A fairing used to give shape but not strength to an object. A fillet produces a smooth junction where two surfaces meet.

**Finishing tape.** Another name for surface tape. See surface tape.

**Fishmouth splice.** A type of splice used in a welded tubular structure in which the end of the tube whose inside diameter is the same as the outside diameter of the tube being spliced is cut in the shape of a V, or a fishmouth, and is slipped over the smaller tube welded. A fishmouth splice has more weld area than a butt splice and allows the stresses from one tube to transfer into the other tube gradually.

**Fire pull handle.** The handle in an aircraft flight deck that is pulled at the first indication of an engine fire. Pulling this handle removes the generator from the electrical system, shuts off the fuel and hydraulic fluid to the engine, and closes the compressor bleed air valve. The fire extinguisher agent discharge switch is uncovered, but it is not automatically closed.

**Fire zone.** A portion of an aircraft designated by the manufacturer to require fire-detection and/or fire-extinguishing equipment and a high degree of inherent fire resistance.

**Fitting.** An attachment device that is used to connect components to an aircraft structure.

**Fixed fire-extinguishing system.** A fire-extinguishing system installed in an aircraft.

**Flameout.** A condition in the operation of a gas turbine engine in which the fire in the engine unintentionally goes out.

**Flap (aircraft control).** A secondary control on an airplane wing that changes its camber to increase both its lift and its drag.

**Flap (helicopter rotor blade movement).** Up-and-down movement of the tip of a helicopter rotor blade.

**Flap overload valve.** A valve in the flap system of an airplane that prevents the flaps being lowered at an airspeed which could cause structural damage. If the pilot tries to extend the flaps when the airspeed is too high, the opposition caused by the air flow will open the overload valve and return the fluid to the reservoir.

**Flash point.** The temperature to which a material must be raised for it to ignite, but not continue to burn, when a flame is passed above it.

**Flat pattern layout.** The pattern for a sheet metal part that has the material used for each flat surface, and for all of the bends, marked out with bend-tangent lines drawn between the flats and bend allowances.

**Flight controller.** The component in an autopilot system that allows the pilot to maneuver the aircraft manually when the autopilot is engaged.

**Fluid.** A form of material whose molecules are able to flow past one another without destroying the material. Gases and liquids are both fluids.

**Fluid power.** The transmission of force by the movement of a fluid. The most familiar examples of fluid power systems are hydraulic and pneumatic systems.

**Flutter.** Rapid and uncontrolled oscillation of a flight control surface on an aircraft that is caused by a dynamically unbalanced condition.

**Fly-by-wire.** A method of control used by some modern aircraft in which control movement or pressures exerted by the pilot are directed into a digital computer where they are input into a program tailored to the flight characteristics of the aircraft. The computer output signal is sent to actuators at the control surfaces to move them the optimum amount for the desired maneuver.

**Flying boat.** An airplane whose fuselage is built in the form of a boat hull to allow it to land and takeoff from water. In the past, flying boats were a popular form of large airplane.

**Flying wing.** A type of heavier-than-air aircraft that has no fuselage or separate tail surfaces. The engines and useful load are carried inside the wing, and movable control surfaces on the trailing edge provide both pitch and roll control.



**Foot-pound.** A measure of work accomplished when a force of 1 pound moves an object a distance of 1 foot.

**Force.** Energy brought to bear on an object that tends to cause motion or to change motion.

**Forehand welding.** Welding in which the torch is pointed in the direction the weld is progressing.

**Form drag.** Parasite drag caused by the form of the object passing through the air.

**Former.** An aircraft structural member used to give a fuselage its shape.

**FMC.** Flight Management Computer.

**Forward bias.** A condition of operation of a semiconductor device such as a diode or transistor in which a positive voltage is connected to the P-type material and a negative voltage to the N-type material.

**FPD.** Freezing point depressant.

**Fractional distillation.** A method of separating the various components from a physical mixture of liquids. The material to be separated is put into a container and its temperature is increased. The components having the lowest boiling points boil off first and are condensed. Then, as the temperature is further raised, other components are removed. Kerosene, gasoline, and other petroleum products are obtained by fractional distillation of crude oil.

**Frangible.** Breakable, or easily broken.

**Freon.** The registered trade name for a refrigerant used in a vapor-cycle air conditioning system.

**Frise aileron.** An aileron with its hinge line set back from the leading edge so that when it is deflected upward, part of the leading edge projects below the wing and produces parasite drag to help overcome adverse yaw.

**Full-bodied.** Not thinned.

**Fully articulated rotor.** A helicopter rotor whose blades are attached to the hub in such a way that they are free to flap, drag, and feather. See each of these terms.

**Frost.** Ice crystal deposits formed by sublimation when the temperature and dew point are below freezing.

**Fuel-flow transmitter.** A device in the fuel line between the engine-driven fuel pump and the carburetor that measures the rate of flow of the fuel. It converts this flow rate into an electrical signal and sends it to an indicator in the instrument panel.

**Fuel jettison system.** A system installed in most large aircraft that allows the flight crew to jettison, or dump, fuel to lower the gross weight of the aircraft to its allowable landing weight. Boost pumps in the fuel tanks move the fuel from the tank into a fuel manifold. From the fuel manifold, it flows away from the aircraft through dump chutes at each wing tip. The fuel jettison system must be so designed and constructed that it is free from fire hazards.

**Fuel totalizer.** A fuel quantity indicator that gives the total amount of fuel remaining on board the aircraft on one instrument. The totalizer adds the quantities of fuel in all of the tanks.

**Fungus (plural: fungi).** Any of several types of plant life that include yeasts, molds, and mildew.

**Fusible plugs.** Plugs in the wheels of high-performance airplanes that use tubeless tires. The centers of the plugs are filled with a metal that melts at a relatively low temperature. If a takeoff is aborted and the pilot uses the brakes excessively, the heat transferred into the wheel will melt the center of the fusible plugs and allow the air to escape from the tire before it builds up enough pressure to cause an explosion.

**Gauge (rivet).** The distance between rows of rivets in a multirow seam. Gauge is also called transverse pitch.

**Gauge pressure.** Pressure referenced from the existing atmospheric pressure.

**Galling.** Fretting or pulling out chunks of a surface by sliding contact with another surface or body.

**Gasket.** A seal between two parts where there is no relative motion.

**Gear-type pump.** A constant-displacement fluid pump that contains two meshing large-tooth spur gears. Fluid is drawn into the pump as the teeth separate and is carried around the inside of the housing with teeth and is forced from the pump when the teeth come together.

**General Aviation Airworthiness Alerts.** Documents published by the FAA that provide an economical interchange of service experience and cooperation in the improvement of aeronautical product durability, reliability, and safety. Alerts include items that have been reported to be significant, but which have not been fully evaluated at the time the material went to press.

**Generator.** A mechanical device that transforms mechanical energy into electrical energy by rotating a coil inside a magnetic field. As the conductors in the coil cut across the lines of magnetic flux, a voltage is generated that causes current to flow.

**Generator series field.** A set of heavy field windings in a generator connected in a series with the armature. The magnetic field produced by the series windings is used to change the characteristics of the generator.

**Generator shunt field.** A set of field windings in a generator connected in parallel with the armature. Varying the amount of current flowing in the shunt field windings controls the voltage output of the generator.

**Gerotor pump.** A form of constant-displacement gear pump. A gerotor pump uses an external-tooth spur gear that rides inside of and drives an internal-tooth rotor gear. There is one more tooth space inside the rotor than there are teeth on the drive gear. As the gears rotate, the volume of the space between two of the teeth on the inlet side of the pump increases, while the volume of the space between the two teeth on the opposite side of the pump decreases.

**GHz (gigahertz).** 1,000,000,000 cycles per second.

**Gimbal.** A support that allows a gyroscope to remain in an upright condition when its base is tilted.

**Glass cockpit.** An aircraft instrument system that uses a few cathode-ray-tube displays to replace a large number of mechanically actuated instruments.

**Glaze ice.** Ice that forms when large drops of water strike a surface whose temperature is below freezing. Glaze ice is clear and heavy.

**Glide slope.** The portion of an ILS (Instrument Landing System) that provides the vertical path along which an aircraft descends on an instrument landing.

**Goniometer.** Electronic circuitry in an ADF system that uses the output of a fixed loop antenna to sense the angle between a fixed reference, usually the nose of the aircraft, and the direction from which the radio signal is being received.

**Gram.** The basic unit of weight or mass in the metric system. One gram equals approximately 0.035 ounce.

**Graphite.** A form of carbon. Structural graphite is used in composite structure because of its strength and stiffness.

**Greige (pronounced “gray”).** The unshrunk condition of a polyester fabric as it is removed from the loom.

**Ground effect.** The increased aerodynamic lift produced when an airplane or helicopter is flown nearer than half wing span or rotor span to the ground. This additional lift is caused by an effective increase in angle of attack without the accompanying increase in induced drag, which is caused by the deflection of the downwashed air.

**Ground.** The voltage reference point in an aircraft electrical system. Ground has zero electrical potential. Voltage values, both positive and negative, are measured from ground. In the United Kingdom, ground is spoken of as “earth.”

**Ground-power unit (GPU).** A service component used to supply electrical power to an aircraft when it is being operated on the ground.

**Guncotton.** A highly explosive material made by treating cotton fibers with nitric and sulfuric acids. Guncotton is used in making the film base of nitrate dope.

**Gusset.** A small plate attached to two or more members of a truss structure. A gusset strengthens the truss.

**Gyro (gyroscope).** The sensing device in an autopilot system. A gyroscope is a rapidly spinning wheel with its weight concentrated around its rim. Gyroscopes have two basic characteristics that make them useful in aircraft instruments: rigidity in space and precession. See rigidity in space and precession.

**Gyroscopic precession.** The characteristic of a gyroscope that causes it to react to an applied force as though the force were applied at a point 90° in the direction of rotation from the actual point of application. The rotor of a helicopter acts in much the same way as a gyroscope and is affected by gyroscopic precession.

**Halon 1211.** A halogenated hydrocarbon fire-extinguishing agent used in many HRD fire-extinguishing systems for powerplant protection. The technical name for Halon 1211 is bromochlorodifluoromethane.

**Halon 1301.** A halogenated hydrocarbon fire-extinguishing agent that is one of the best for extinguishing cabin and powerplant fires. It is highly effective and is the least toxic of the extinguishing agents available. The technical name for Halon 1301 is bromotrifluoromethane.

**Hangar rash.** Scrapes, bends, and dents in an aircraft structure caused by careless handling.

**Hardwood.** Wood from a broadleaf tree that sheds its leaves each year.

**Heading indicator.** A gyroscopic flight instrument that gives the pilot an indication of the heading of the aircraft.

**Heat exchanger.** A device used to exchange heat from one medium to another. Radiators, condensers, and evaporators are all examples of heat exchangers. Heat always moves from the object or medium having the greatest level of heat energy to a medium or object having a lower level.

**Helix.** A screw-like, or spiral, curve.

**Hertz.** One cycle per second.

**Holding relay.** An electrical relay that is closed by sending a pulse of current through the coil. It remains closed until the current flowing through its contacts is interrupted.

**Homebuilt aircraft.** Aircraft that are built by individuals as a hobby rather than by factories as commercial products. Homebuilt, or amateur-built, aircraft are not required to meet the stringent requirements imposed on the manufacture of FAA-certified aircraft.

**Horsepower.** A unit of mechanical power that is equal to 33,000 foot-pounds of work done in 1 minute, or 550 foot-pounds of work done in 1 second.

**Hot dimpling.** A process used to dimple, or indent, the hole into which a flush rivet is to be installed. Hot dimpling is done by clamping the metal between heating elements and forcing the dies through the holes in the softened metal. Hot dimpling prevents hard metal from cracking when it is dimpled.

**Hot-wire cutter.** A cutter used to shape blocks of Styrofoam. The wire is stretched tight between the arms of a frame and heated by electrical current. The hot wire melts its way through the foam.

**HRD.** High-rate-discharge.

**HSI.** Horizontal situation indicator.

**Hydraulic actuator.** The component in a hydraulic system that converts hydraulic pressure into mechanical force. The two main types of hydraulic actuators are linear actuators (cylinders and pistons) and rotary actuators (hydraulic motors).

**Hydraulic fuse.** A type of flow control valve that allows a normal flow of fluid in the system but, if the flow rate is excessive, or if too much fluid flows for normal operation, the fuse will shut off all further flow.

**Hydraulic motor.** A hydraulic actuator that converts fluid pressure into rotary motion. Hydraulic motors have an advantage in aircraft installations over electric motors, because they can operate in a stalled condition without the danger of a fire.

**Hydraulic power pack.** A small, self-contained hydraulic system that consists of a reservoir, pump, selector valves, and relief valves. The power pack is removable from the aircraft as a unit to facilitate maintenance and service.

**Hydraulics.** The system of fluid power which transmits force through an incompressible fluid.

**Hydrocarbon.** An organic compound that contains only carbon and hydrogen. The vast majority of fossil fuels, such as gasoline and turbine-engine fuel, are hydrocarbons.

**Hydroplaning.** A condition that exists when a high-speed airplane is landed on a water-covered runway. When the brakes are applied, the wheels lock up and the tires skid on the surface of the water in much the same way a water ski rides on the surface. Hydroplaning develops enough heat in a tire to ruin it.

**Hydrostatic test.** A pressure test used to determine the serviceability of high-pressure oxygen cylinders. The cylinders are filled with water and pressurized to 5/3 of their working pressure. Standard-weight cylinders (DOT 3AA) must be hydrostatically tested every five years, and lightweight cylinders (DOT 3HT) must be tested every three years.

**Hypersonic speed.** Speed of greater than Mach 5 (5 times the speed of sound).

**Hyperbolic navigation.** Electronic navigation systems that determine aircraft location by the time difference between reception of two signals. Signals from two stations at different locations will be received in the aircraft at different times. A line plotted between two stations along which the time difference is the same forms a hyperbola.

**Hypoxia.** A physiological condition in which a person is deprived of the needed oxygen. The effects of hypoxia normally disappear as soon as the person is able to breathe air containing sufficient oxygen.

**ICAO.** The International Civil Aeronautical Organization.

**Icebox rivet.** A solid rivet made of 2017 or 2024 aluminum alloy. These rivets are too hard to drive in the condition they are received from the factory, and must be heat-treated to soften them. They are heated in a furnace and then quenched in cold water. Immediately after quenching they are soft, but within a few hours at room temperature they become quite hard. The hardening can be delayed for several days by storing them in a subfreezing icebox and holding them at this low temperature until they are to be used.

**IFR.** Instrument flight rules.

**Inch-pound.** A measure of work accomplished when a force of 1 pound moves an object a distance of 1 inch.

**Indicated airspeed (IAS).** The airspeed as shown on an airspeed indicator with no corrections applied.

**Induced current.** Electrical current produced in a conductor when it is moved through or crossed by a magnetic field.

**Induced drag.** Aerodynamic drag produced by an airfoil when it is producing lift. Induced drag is affected by the same factors that affect induced lift.

**Induction time.** The time allowed an epoxy or polyurethane material between its initial mixing and its application. This time allows the materials to begin their cure.

**Infrared radiation.** Electromagnetic radiation whose wavelengths are longer than those of visible light.

**Ingot.** A large block of metal that was molded as it was poured from the furnace. Ingots are further processed into sheets, bars, tubes, or structural beams.

**INS.** Inertial Navigation System.

**Inspection Authorization (IA).** An authorization that may be issued to an experienced aviation maintenance technician who holds both an Airframe and Powerplant rating. It allows the holder to conduct annual inspections and to approve an aircraft or aircraft engine for return to service after a major repair or major alteration.

**Integral fuel tank.** A fuel tank which is formed by sealing off part of the aircraft structure and using it as a fuel tank. An integral wing tank is called a “wet wing.” Integral tanks are used because of their large weight saving. The only way of repairing an integral fuel tank is by replacing damaged sealant and making riveted repairs, as is done with any other part of the aircraft structure.

**Interference drag.** Parasite drag caused by air flowing over one portion of the airframe interfering with the smooth flow of air over another portion.

**Intermittent-duty solenoid.** A solenoid-type switch whose coil is designed for current to flow through it for only a short period of time. The coil will overheat if current flows through it too long.

**IRS.** Inertial Reference System.

**IRU.** Inertial Reference Unit.

**Iso-octane.** A hydrocarbon,  $C_8H_{18}$ , which has very high critical pressure and temperature. Iso-octane is used as the high reference for measuring the antidetonation characteristics of a fuel.

**Isobaric mode.** The mode of pressurization in which the cabin pressure is maintained at a constant value regardless of the outside air pressure.

**Isogonic line.** A line drawn on an aeronautical chart along which the angular difference between the magnetic and geographic north poles is the same.

**Isopropyl alcohol.** A colorless liquid used in the manufacture of acetone and its derivatives and as a solvent and anti-icing agent.

**Jackscrew.** A hardened steel rod with strong threads cut into it. A jackscrew is rotated by hand or with a motor to apply a force or to lift an object.

**Jet pump.** A special venturi in a line carrying air from certain areas in an aircraft that need an augmented flow of air through them. High-velocity compressor bleed air is blown into the throat of a venturi where it produces a low pressure that pulls air from the area to which it is connected. Jet pumps are often used in the lines that pull air through galleys and toilet areas.

**Joggle.** A small offset near the edge of a piece of sheet metal. It allows one sheet of metal to overlap another sheet while maintaining a flush surface.

**Jointer.** A woodworking power tool used to smooth edges of a piece of wood.

**K-factor.** A factor used in sheet metal work to determine the setback for other than a 90° bend.  $\text{Setback} = K \cdot (\text{bend radius} + \text{metal thickness})$ . For bends of less than 90°, the value of K is less than 1; for bends greater than 90°, the value of K is greater than 1.

**Kevlar.** A patented synthetic aramid fiber noted for its flexibility and light weight. It is to a great extent replacing fiberglass as a reinforcing fabric for composite construction.

**Key (verb).** To initiate an action by depressing a key or a button.

**kHz (kilohertz).** 1,000 cycles per second.

**Kick-in pressure.** The pressure at which an unloading valve causes a hydraulic pump to direct its fluid into the system manifold.

**Kick-out pressure.** The pressure at which an unloading valve shuts off the flow of fluid into the system pressure manifold and directs it back to the reservoir under a much reduced pressure.

**Kilogram.** One thousand grams.

**Kinetic energy.** Energy that exists because of motion.

**Knot (wood defect).** A hard, usually round section of a tree branch embedded in a board. The grain of the knot is perpendicular to the grain of the board. Knots decrease the strength of the board and should be avoided where strength is needed.

**Knot (measure of speed).** A speed measurement that is equal to one nautical mile per hour. One knot is equal to 1.15 statute mile per hour.

**Kollsman window.** The barometric scale window of a sensitive altimeter. See barometric scale.

**Koroseal lacing.** A plastic lacing material available in round or rectangular cross sections and used for holding wire bundles and tubing together. It holds tension on knots indefinitely and is impervious to petroleum products.

**Kraft paper.** A tough brown wrapping paper, like that used for paper bags.

**Labyrinth seal.** A type of seal in a Roots blower cabin supercharger that is made in the form of knife edges riding in step-shaped grooves. Air pressure is dropped in each section of the seal, and any oil in the air is trapped in the grooves.

**Lacquer.** A finishing material made of a film base, solvents, plasticizers, and thinners. The film base forms a tough film over the surface when it dries. The solvents dissolve the film base so it can be applied as a liquid. The plasticizers give the film base the needed resilience, and the thinners dilute the lacquer so it can be applied with a spray gun. Lacquer is sprayed on the surface as a liquid, and when the solvents and thinners evaporate, the film base remains as a tough decorative and protective coating.

**Landing gear warning system.** A system of lights used to indicate the condition of the landing gear. A red light illuminates when any of the gears are in an unsafe condition; a green light shows when all of the gears are down and locked, and no light is lit when the gears are all up and locked. An aural warning system is installed that sounds a horn if any of the landing gears are not down and locked when the throttles are retarded for landing.

**Laminar flow.** Airflow in which the air passes over the surface in smooth layers with a minimum of turbulence.

**Laminated wood.** A type of wood made by gluing several pieces of thin wood together. The grain of all pieces runs in the same direction.

**Latent heat.** Heat that is added to a material that causes a change in its state without changing its temperature.

**Lateral axis.** An imaginary line, passing through the center of gravity of an airplane, and extending across it from wing tip to wing tip.

**Lay-up.** The placement of the various layers of resin-impregnated fabric in the mold for a piece of laminated composite material.

**L/D ratio.** A measure of efficiency of an airfoil. It is the ratio of the lift to the total drag at a specified angle of attack.

**Left-right indicator.** The course-deviation indicator used with a VOR navigation system.

**Lightening hole.** A hole cut in a piece of structural material to get rid of weight without losing any strength. A hole several inches in diameter may be cut in a piece of metal at a point where the metal is not needed for strength, and the edges of the hole are flanged to give it rigidity. A piece of metal with properly flanged lightening holes is more rigid than the metal before the holes were cut.

**Linear actuator.** A fluid power actuator that uses a piston moving inside a cylinder to change pressure into linear, or straight-line, motion.

**Linear change.** A change in which the output is directly proportional to the input.

**Loadmeter.** A current meter used in some aircraft electrical systems to show the amount of current the generator or alternator is producing. Loadmeters are calibrated in percent of the generator rated output.

**Localizer.** The portion of an ILS (Instrument Landing System) that directs the pilot along the center line of the instrument runway.

**Lodestone.** A magnetized piece of natural iron oxide.

**Logic flow chart.** A type of graphic chart that can be made up for a specific process or procedure to help follow the process through all of its logical steps.

**Longitudinal axis.** An imaginary line, passing through the center of gravity of an airplane, and extending lengthwise through it from nose to tail.

**Longitudinal stability.** Stability of an aircraft along its longitudinal axis and about its lateral axis. Longitudinal stability is also called pitch stability.

**LORAN A.** Long Range Aid to Navigation. A hyperbolic navigation system that operates with frequencies of 1,950 kHz, 1,850 kHz, and 1,900 kHz.

**LORAN C.** The LORAN system used in aircraft. It operates on a frequency of 100 kHz.

**LRU.** Line replaceable unit.

**Lubber line.** A reference on a magnetic compass and directional gyro that represents the nose of the aircraft. The heading of the aircraft is shown on the compass card opposite the lubber line.

**Mach number.** A measurement of speed based on the ratio of the speed of the aircraft to the speed of sound under the same atmospheric conditions. An airplane flying at Mach 1 is flying at the speed of sound.

**Magnetic bearing.** The direction to or from a radio transmitting station measured relative to magnetic north.

**Major alteration.** An alteration not listed in the aircraft, aircraft engine, or propeller specifications. It is one that might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness, or that cannot be made with elementary operations.

**Major repair.** A repair to an aircraft structure or component that if improperly made might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness, or that is not done according to accepted practices, or cannot be made with elementary operation.

**Manifold cross-feed fuel system.** A type of fuel system commonly used in large transport category aircraft. All fuel tanks feed into a common manifold, and the dump chutes and the single-point fueling valves are connected to the manifold. Fuel lines to each engine are taken from the manifold.

**Manifold pressure.** The absolute pressure of the air in the induction system of a reciprocating engine.

**Manifold pressure gauge.** A pressure gauge that measures the absolute pressure inside the induction system of a reciprocating engine. When the engine is not operating, this instrument shows the existing atmospheric pressure.

**Master switch.** A switch in an aircraft electrical system that can disconnect the battery from the bus and open the generator or alternator field circuit.

**Matrix.** The material used in composite construction to bond the fibers together and to transmit the forces into the fibers. Resins are the most widely used matrix materials.

**Mean camber.** A line that is drawn midway between the upper and lower camber of an airfoil section. The mean camber determines the aerodynamic characteristics of the airfoil.

**MEK.** Methyl-ethyl-ketone is an organic chemical solvent that is soluble in water and is used as a solvent for vinyl and nitrocellulose films. MEK is an efficient cleaner for preparing surfaces for priming or painting.

**Mercerize.** A treatment given to cotton thread to make it strong and lustrous. The thread is stretched while it is soaked in a solution of caustic soda.

**MFD.** Multi-function display.

**MHz (megahertz).** 1,000,000 cycles per second.

**Microballoons.** Tiny, hollow spheres of glass or phenolic material used to add body to a resin.

**Microbial contaminants.** The scum that forms inside the fuel tanks of turbine-engine-powered aircraft that is caused by micro-organisms. These micro-organisms live in water that condenses from fuel, and they feed on the fuel. The scum they form clogs fuel filters, lines, and fuel controls and holds water in contact with the aluminum alloy structure, causing corrosion.

**Micro-Mesh.** A patented graduated series of cloth-backed cushioned seats that contain abrasive crystals. Micro-Mesh is used for polishing and restoring transparency to acrylic plastic windows and windshields.

**Micron (“micro meter”).** A unit of linear measurement equal to one millionth of a meter, one thousandth of a millimeter, or 0.000039 inch. A micron is also called a micrometer.

**Micronic filter.** The registered trade name of a type of fluid filter whose filtering element is a specially treated cellulose paper formed into vertical convolutions, or wrinkles. Micronic filters prevent the passage of solids larger than about 10 microns, and are normally replaced with new filters rather than cleaned.

**Micro-organism.** An organism, normally bacteria or fungus, or microscopic size.

**Microswitch.** The registered trade name for a precision switch that uses a short throw of the control plunger to actuate the contacts. Microswitches are used primarily as limit switches to control electrical units automatically.

**MIG welding.** Metal inert gas welding is a form of electric arc welding in which the electrode is an expendable wire. MIG welding is now called GMA (gas metal arc) welding.

**Mil.** One thousandth of an inch (0.001 inch). Paint film thickness is usually measured in mils.

**Mildew.** A gray or white fungus growth that forms on organic materials. Mildew forms on cotton and linen aircraft fabric and destroys its strength.

**Millivoltmeter.** An electrical instrument that measures voltage in units of millivolts (thousandths of a volt).

**Mist coat.** A very light coat of zinc chromate primer. It is so thin that the metal is still visible, but the primer makes pencil marks easy to see.

**Moisture separator.** A component in a high-pressure pneumatic system that removes most of the water vapor from the compressed air. When the compressed air is used, its pressure drops, and this pressure drop causes a drop in temperature. If any moisture were allowed to remain in the air, it would freeze and block the system.

**Mold line.** A line used in the development of a flat pattern for a formed piece of sheet metal. The mold line is an extension of the flat side of a part beyond the radius. The mold line dimension of a part is the dimension made to the intersection of mold lines and is the dimension the part would have if its corners had no radius.

**Mold point.** The intersection of two mold lines of a part. Mold line dimensions are made between mold points.

**Moment.** A force that causes or tries to cause an object to rotate. The value of a moment is the product of the weight of an object (or the force), multiplied by the distance between the center of gravity of the object (or the point of application of the force) and the fulcrum about which the object rotates.

**Monel.** An alloy of nickel, copper, and aluminum or silicon.

**Monocoque.** A single-shell type of aircraft structure in which all of the flight loads are carried in the outside skin of the structure.

**MSDS.** Material Safety Data Sheets. MSDS are required by the Federal Government to be available in workplaces to inform workers of the dangers that may exist from contact with certain materials.

**MSL.** Mean sea level. When the letters MSL are used with an altitude, it means that the altitude is measured from mean, or average, sea level.

**MTBF.** Mean time between failures.

**Multimeter.** An electrical test instrument that consists of a single current-measuring meter and all of the needed components to allow the meter to be used to measure voltage, resistance, and current. Multimeters are available with either analog-or digital-type displays.

**Multiple-disk brakes.** Aircraft brakes in which one set of disks is keyed to the axle and remains stationary. Between each stationary disk there is a rotating disk that is keyed to the inside of the wheel. When the brakes are applied, the stationary disks are forced together, clamping the rotating disks between them. The friction between the disks slows the aircraft.

**Nailing strip.** A method of applying pressure to the glue in a scarf joint repair in a plywood skin. A strip of thin plywood is nailed over the glued scarf joint with the nails extending into a supporting structure beneath the skin. The strip is installed over vinyl sheeting to prevent it sticking to the skin. When the glue is thoroughly dry, the nailing strip is broken away and the nails removed.

**Nap of the fabric.** The ends of the fibers in a fabric. The first coat of dope on cotton or linen fabric raises the nap, and the fiber ends stick up. These ends must be carefully removed by sanding to get a smooth finish.

**Naphtha.** A volatile and flammable hydrocarbon liquid used chiefly as a solvent or as a cleaning fluid.

**NDB.** Non-directional beacons.

**Negative pressure relief valve (pressurization component).** A valve that opens anytime the outside air pressure is greater than the cabin pressure. It prevents the cabin altitude from ever becoming greater than the aircraft flight altitude.

**Neutral axis (neutral plane).** A line through a piece of material that is bent. The material in the outside of the bend is stretched and that on the inside of the bend is shrunk. The material along the neutral plane is neither shrunk nor stretched.

**Neutral flame.** An oxyacetylene flame produced when the ratio of oxygen and acetylene is chemically correct and there is no excess of oxygen or carbon. A neutral flame has a rounded inner cone and no feather around it.

**Noise (electrical).** An unwanted electrical signal within a piece of electronic equipment.

**Nomex.** A patented nylon material used to make the honeycomb core for certain types of sandwich materials.

**Nonenergizing brake.** A brake that does not use the momentum of the aircraft to increase the friction.

**Nonvolatile memory.** Memory in a computer that is not lost when power to the computer is lost.

**Normal heptane.** A hydrocarbon,  $C_7H_{16}$ , with a very low critical pressure and temperature. Normal heptane is used as the low reference in measuring the anti-detonation characteristics of a fuel.

**Normal shock wave.** A shock wave that forms ahead of a blunt object moving through the air at the speed of sound. The shock wave is normal (perpendicular) to the air approaching the object. Air passing through a normal shock wave is slowed to a subsonic speed and its static pressure is increased.

**Normalizing.** A process of strain-relieving steel that has been welded and left in a strained condition. The steel is heated to a specified temperature, usually red hot, and allowed to cool in still air to room temperature.

**Nose-gear centering cam.** A cam in the nose-gear shock strut that causes the piston to center when the strut fully extends. When the aircraft takes off and the strut extends, the wheel is straightened in its fore-and-aft position so it can be retracted into the wheel well.

**NPN transistor.** A bipolar transistor made of a thin base of P-type silicon or germanium sandwiched between a collector and an emitter, both of which are made of N-type material.

**Null position.** The position of an ADF loop antenna when the signal being received is canceled in the two sides of the loop and the signal strength is the weakest.

**Oblique shock wave.** A shock wave that forms on a sharp-pointed object moving through air at a speed greater than the speed of sound. Air passing through an oblique shock wave is slowed down, but not to a subsonic speed, and its static pressure is increased.

**Oleo shock absorber.** A shock absorber used on aircraft landing gear. The initial landing impact is absorbed by oil transferring from one compartment in the shock strut into another compartment through a metering orifice. The shocks of taxiing are taken up by a cushion of compressed air.

**Octane rating.** A rating of the anti-detonation characteristics of a reciprocating engine fuel. It is based on the performance of the fuel in a special test engine. When a fuel is given a dual rating such as 80/87, the first number is its anti-detonating rating with a lean fuel-air mixture, and the higher number is its rating with a rich mixture.

**Open angle.** An angle in which sheet metal is bent less than  $90^\circ$ .

**Open assembly time.** The period of time between the application of the glue and the assembly of the joint components.



**Open-hydraulic system.** A fluid power system in which the selector valves are arranged in series with each other. Fluid flows from the pump through the center of the selector valves, back into the reservoir when no unit is being actuated.

**Open-center selector valve.** A type of selector valve that functions as an unloading valve as well as a selector valve. Open-center selector valves are installed in series, and when no unit is actuated, fluid from the pump flows through the centers of all the valves and returns to the reservoir. When a unit is selected for actuation, the center of the selector valve is shut off and the fluid from the pump goes through the selector valve into one side of the actuator. Fluid from the other side of the actuator returns to the valve and goes back to the reservoir through the other selector valves. When the actuation is completed, the selector valve is placed in its neutral position. Its center opens, and fluid from the pump flows straight through the valve.

**Open wiring.** An electrical wiring installation in which the wires are tied together in bundles and clamped to the aircraft structure rather than being enclosed in conduit.

**Orifice check valve.** A component in a hydraulic or pneumatic system that allows unrestricted flow in one direction, and restricted flow in the opposite direction.

**O-ring.** A widely used type of seal made in the form of a rubber ring with a round cross section. An O-ring seals in both directions, and it can be used as a packing or a gasket.

**Ornithopter.** A heavier-than-air flying machine that produces lift by flapping its wings. No practical ornithopter has been built.

**Oscilloscope.** An electrical instrument that displays on the face of a cathode-ray tube the waveform of the electrical signal it is measuring.

**Outflow valve (pressurization component).** A valve in the cabin of a pressurized aircraft that controls the cabin pressure by opening to relieve all pressure above that for which the cabin pressure control is set.

**Overvoltage protector.** A component in an aircraft electrical system that opens the alternator field circuit any time the alternator output voltage is too high.

**Oxidizing flame.** An oxyacetylene flame in which there is an excess of oxygen. The inner cone is pointed and often a hissing sound is heard.

**Ozone.** An unstable form of oxygen produced when an electric spark passes through the air. Ozone is harmful to rubber products.

**Packing.** A seal between two parts where there is relative motion.

**Paint.** A covering applied to an object or structure to protect it and improve its appearance. Paint consists of a pigment suspended in a vehicle such as oil or water. When the vehicle dries by evaporation or curing, the pigment is left as a film on the surface.

**Parabolic reflector.** A reflector whose surface is made in the form of a parabola.

**Parallel circuit.** A method of connecting electrical components so that each component is in a path between the terminals of the source of electrical energy.

**Paralleling circuit.** A circuit in a multi-engine aircraft electrical system that controls a flow of control current which is used to keep the generators or alternators sharing the electrical load equally. The relay opens automatically to shut off the flow of paralleling current any time the output of either alternator or generator drops to zero.

**Paralleling relay.** A relay in multi-engine aircraft electrical system that controls a flow of control current which is used to keep the generators or alternators sharing the electrical load equally. The relay opens automatically to shut off the flow of paralleling current any time the output of either alternator or generator drops to zero.

**Parasite drag.** A form of aerodynamic drag caused by friction between the air and the surface over which it is flowing.

**Parent metal.** The metal being welded. This term is used to distinguish between the metal being welded and the welding rod.

**Partial pressure.** The percentage of the total pressure of a mixture of gases produced by each of the individual gases in the mixture.

**Parting film.** A layer of thin plastic material placed between a composite lay-up and the heating blanket. It prevents the blanket from sticking to the fabric.

**Pascal's Law.** A basic law of fluid power which states that the pressure in an enclosed container is transmitted equally and undiminished to all points of the container, and the force acts at right angles to the enclosing walls.

**Performance number.** The anti-detonation rating of a fuel that has a higher critical pressure and temperature than iso-octane (a rating of 100). Iso-octane that has been treated with varying amounts of tetraethyl lead is used as the reference fuel.

**Petrolatum-zinc dust compound.** A special abrasive compound used inside an aluminum wire terminal being swaged onto a piece of aluminum electrical wire. When the terminal is compressed, the zinc dust abrades the oxides from the wire, and the petrolatum prevents oxygen reaching the wire so no more oxides can form.

**Petroleum fractions.** The various components of a hydrocarbon fuel that are separated by boiling them off at different temperatures in the process of fractional distillation.

**Phased array antenna.** A complex antenna which consists of a number of elements. A beam of energy is formed by the superimposition of the signals radiating from the elements. The direction of the beam can be changed by varying the relative phase of the signals applied to each of the elements.

**Phenolic plastic.** A plastic material made of a thermosetting phenol-formaldehyde resin, reinforced with cloth or paper. Phenolic plastic materials are used for electrical insulators and for chemical-resistant table tops.

**Pilot hole.** A small hole punched or drilled in a piece of sheet metal to locate a rivet hole.

**Pin knot cluster.** A group of knots, all having a diameter of less than approximately  $\frac{1}{16}$  inch.

**Pinked-edge tape.** Cloth tape whose edges have small V-shaped notches cut along their length. The pinked edges prevent the tape from raveling.

**Pinking shears.** Shears used to cut aircraft fabric with a series of small notches along the cut edge.

**Pinion.** A small gear that meshes with a larger gear, a sector of a gear, or a toothed rack.

**Piston.** A sliding plug in an actuating cylinder used to convert pressure into force and then into work.

**Pitch (aircraft maneuver).** Rotation of an aircraft about its lateral axis.

**Pitch (rivet).** The distance between the centers of adjacent rivets installed in the small row.

**Pitch pocket (wood defect).** Pockets of pitch that appear in the growth rings of a piece of wood.

**Pitot pressure.** Ram air pressure used to measure airspeed. The pitot tube faces directly into the air flowing around the aircraft. It stops the air and measures its pressure.

**Plain-weave fabric.** Fabric in which each warp thread passes over one fill thread and under the next. Plain-weave fabric typically has the same strength in both warp and fill directions.

**Plan position indicator (PPI).** A type of radar scope that shows both the direction and distance of the target from the radar antenna. Some radar antenna rotate and their PPI scopes are circular. Other antenna oscillate and their PPI scopes are fan shaped.

**Planer.** A woodworking power tool used to smooth the surfaces of a piece of wood.

**Plasticizer.** A constituent in dope or lacquer that gives its film flexibility and resilience.

**Plastic media blasting (PMB).** A method of removing paint from an aircraft surface by dry-blasting it with tiny plastic beads.

**Plastics.** The generic name for any of the organic materials produced by polymerization. Plastics can be shaped by molding or drawing.

**Plenum.** An enclosed chamber in which air can be held at a pressure higher than that of the surrounding air.

**Ply rating.** The rating of an aircraft tire that indicates its relative strength. The ply rating does not indicate the actual number of plies of fabric in the tire; it indicates the number of piles of cotton fabric needed to produce the same strength as the actual piles.

**Plywood.** A wood product made by gluing several pieces of thin wood veneer together. The grain of the wood in each layer runs at 90° or 45° to the grain of the layer next to it.

**Pneumatics.** The system of fluid power which transmits force by the use of a compressible fluid.

**PNP transistor.** A bipolar transistor made of a thin base of N-type silicon or germanium sandwiched between a collector and an emitter, both of which are made of P-type material.

**Polyester fibers.** A synthetic fiber made by the polymerization process in which tiny molecules are united to form a long chain of molecules. Polyester fibers are woven into fabrics that are known by their trade names of Dacron, Fortrel, and Kodel. Polyester film and sheet are known as Mylar and Celenar.

**Polyester resin.** A thermosetting resin used as a matrix for much of the fiberglass used in composite construction.

**Polyurethane enamel.** A hard, chemically resistant finish used on aircraft. Polyurethane enamel is resistant to damage from all types of hydraulic fluid.

**Polyvinyl chloride.** A thermoplastic resin used in the manufacture of transparent tubing for electrical insulation and fluid lines which are subject to low pressures.

**Position error.** The error in pitot-static instruments caused by the static ports not sensing true static air pressure. Position error changes with airspeed and is usually greatest at low airspeeds.

**Potential energy.** Energy possessed in an object because of its position, chemical composition, shape, or configuration.

**Potentiometer.** A variable resistor having connections to both ends of the resistance element and to the wiper that moves across the resistance.

**Pot life.** The length of time a resin will remain workable after the catalyst has been added. If a catalyzed material is not used within its usable pot life, it must be discarded and a new batch mixed up.

**Power.** The time rate of doing work. Power is force multiplied by distance (work), divided by time.

**Power brakes.** Aircraft brakes that use the main hydraulic system to supply fluid for the brake actuation. Aircraft that require a large amount of fluid for their brake actuation normally use power brakes, and the volume of fluid sent to the brakes is increased by the use of boosters.

**Power control valve.** A hand-operated hydraulic pump unloading valve. When the valve is open, fluid flows from the pump to the reservoir with little opposition. To actuate a unit, turn the selector valve, and manually close the power control valve. Pressurized fluid flows to the unit, and when it is completely actuated, the power control valve automatically opens.

**Precession.** The characteristic of a gyroscope that causes a force to be felt, not at the point of application, but at a point 90° in the direction of rotation from that point.

**Preflight inspection.** A required inspection to determine the condition of the aircraft for the flight to be conducted. It is conducted by the pilot-in-command.

**Precipitation heat treatment.** A method of increasing the strength of heat-treated aluminum alloy. After the aluminum alloy has been solution-heat-treated by heating and quenching, it is returned to the oven and heated to a temperature lower than that used for the initial heat treatment. It is held at this temperature for a specified period of time, and then removed from the oven and allowed to cool slowly.

**Prepreg (preimpregnated fabric).** A type of composite material in which the reinforcing fibers are encapsulated in an uncured resin. Prepreg materials must be kept refrigerated to prevent them from curing before they are used.

**Press-to-test light fixture.** An indicator light fixture whose lens can be pressed in to complete a circuit that tests the filament of the light bulb.

**Pressure.** Force per unit area. Hydraulic and pneumatic pressure are normally given in units of pounds per square inch (psi).

**Pressure altitude.** The altitude in standard air at which the pressure is the same as that of the existing air. Pressure altitude is read on an altimeter when the barometric scale is set to the standard sea level pressure of 29.92 inches of mercury.

**Pressure-demand oxygen system.** A type of oxygen system used by aircraft that fly at very high altitude. This system functions as a diluter-demand system until, at about 40,000 feet, the output to the mask is pressurized enough to force the needed oxygen into the lungs, rather than depending on the low pressure produced when the wearer of the mask inhales to pull in the oxygen. (See diluter-demand oxygen system.)

**Pressure fueling.** The method of fueling used by almost all transport aircraft. The fuel is put into the aircraft through a single underwing fueling port. The fuel tanks are filled to the desired quantity and in the sequence selected by the person conducting the fueling operation. Pressure fueling saves servicing time by using a single point to fuel the entire aircraft, and it reduces the chances for fuel contamination.

**Pressure manifold (hydraulic system component).** The portion of a fluid power system from which the selector valves receive their pressurized fluid.

**Pressure plate (brake component).** A strong, heavy plate used in a multiple-disk brake. The pressure plate receives the force from the brake cylinders and transmits this force to the disks.

**Pressure reducing valve (oxygen system component).** A valve used in an oxygen system to change high cylinder pressure to low system pressure.

**Pressure relief valve (oxygen system component).** A valve in an oxygen system that relieves the pressure if the pressure reducing valve should fail.

**Pressure vessel.** The strengthened portion of an aircraft structure that is sealed and pressurized in flight.

**Primer (finishing system component).** A component in a finishing system that provides a good bond between the surface and the material used for the topcoats.

**Profile drag.** Aerodynamic drag produced by skin friction. Profile drag is a form of parasite drag.

**Progressive inspection.** An inspection that may be used in place of an annual or 100-hour inspection. It has the same scope as an annual inspection, but it may be performed in increments so the aircraft will not have to be out of service for a lengthy period of time.

**Pump control valve.** A control valve in a hydraulic system that allows the pilot to manually direct the output of the hydraulic pump back to the reservoir when no unit is being actuated.

**Pureclad.** A registered trade name for clad aluminum alloy.

**Purge (air conditioning system operation).** To remove all of the moisture and air from a cooling system by flushing the system with a dry gaseous refrigerant.

**Pusher powerplant.** A powerplant whose propeller is mounted at the rear of the airplane and pushes, rather than pulls, the airplane through the air.

**PVC (Polyvinylchloride).** A thermoplastic resin used to make transparent tubing for insulating electrical wires.

**Quartersawed wood.** Wood sawed from a tree in such a way that the annual rings cross the plank at an angle greater than 45°.

**Quick-disconnect fitting.** A hydraulic line fitting that seals the line when the fitting is disconnected. Quick-disconnect fittings are used on the lines connected to the engine-driven hydraulic pump. They allow the pump to be disconnected and an auxiliary hydraulic power system connected to perform checks requiring hydraulic power while the aircraft is in the hangar.

**Rack-and-pinion actuator.** A form of rotary actuator where the fluid acts on a piston on which a rack of gear teeth is cut. As the piston moves, it rotates a pinion gear which is mated with the teeth cut in the rack.

**Radial.** A directional line radiating outward from a radio facility, usually a VOR. When an aircraft is flying outbound on the 330° from the station.

**Radius dimpling.** A process of preparing a hole in sheet metal for flush riveting. A cone-shaped male die forces the edges of the rivet hole into the depression in a female die. Radius dimpling forms a round-edged depression into which the rivet head fits.

**Range markings.** Colored marks on an instrument dial that identify certain ranges of operation as specified in the aircraft maintenance or flight manual and listed in the appropriate aircraft Type Certificate Data Sheets or Aircraft Specifications. Color coding directs attention to approaching operating difficulties. Airspeed indicators and most pressure and temperature indicators are marked to show the various ranges of operation. These ranges and colors are the most generally used: Red radial line, do not exceed. Green arc, normal operating range. Yellow arc, caution range. Blue radial line, used on airspeed indicators to show best single-engine rate of climb speed. White arc, used on airspeed indicators to show flap operating range.

**RDF.** Radio direction finding.

**Rebreather oxygen mask.** A type of oxygen mask used with a continuous flow oxygen system. Oxygen continuously flows into the bottom of the loose-fitting rebreather bag on the mask. The wearer of the mask exhales into the top of the bag. The first air exhaled contains some oxygen, and this air goes into the bag first. The last air to leave the lungs contains little oxygen, and it is forced out of the bag as the bag is filled with fresh oxygen. Each time the wearer of the mask inhales, the air first exhaled, along with fresh oxygen, is taken into the lungs.

**Receiver-dryer.** The component in a vapor-cycle cooling system that serves as a reservoir for the liquid refrigerant. The receiver-dryer contains a desiccant that absorbs any moisture that may be in the system.

**Rectangle.** A plane surface with four sides whose opposite sides are parallel and whose angles are all right angles.

**Rectification (arc welding condition).** A condition in AC-electric arc welding in which oxides on the surface of the metal act as a rectifier and prevent electrons flowing from the metal to the electrode during the half cycle when the electrode is positive.

**Reducing flame.** See carburizing flame.

**Reed valve.** A thin, leaf-type valve mounted in the valve plate of an air conditioning compressor to control the flow of refrigerant gases into and out of the compressor cylinders.

**Reinforcing tape.** A narrow strip of woven fabric material placed over the fabric as it is being attached to the aircraft structure with rib lacing cord. This tape carries a large amount of the load and prevents the fabric tearing at the stitches.

**Rejuvenator.** A finishing material used to restore resilience to an old dope film. Rejuvenator contains strong solvents to open the dried-out film and plasticizers to restore resilience to the old dope.

**Relative wind.** The direction the wind strikes an airfoil.

**Relay.** An electrical component which uses a small amount of current flowing through a coil to produce a magnetic pull to close a set of contacts through which a large amount of current can flow. The core in a relay coil is fixed.

**Relief hole.** A hole drilled at the point at which two bend lines meet in a piece of sheet metal. This hole spreads the stresses caused by the bends and prevents the metal cracking.

**Relief valve.** A pressure-control valve that relieves any pressure over the amount for which it is set. They are damage-preventing units used in both hydraulic and pneumatic systems. In an aircraft hydraulic system, pressure relief valves prevent damaging high pressures that could be caused by a malfunctioning pressure regulator, or by thermal expansion of fluid trapped in portions of the system.

**Repair.** A maintenance procedure in which a damaged component is restored to its original condition, or at least to a condition that allows it to fulfill its design function.

**Restrictor.** A fluid power system component that controls the rate of actuator movement by restricting the flow of fluid into or out of the actuator.

**Retard breaker points.** A set of breaker points in certain aircraft magnetos that are used to provide a late (retarded) spark for starting the engine.

**Retarder (finishing system component).** Dope thinner that contains certain additives that slow its rate of evaporation enough to prevent dope blushing.

**Retread.** The replacement of the tread rubber on an aircraft tire.

**Retreating blade.** The blade on a helicopter rotor whose tip is moving in the direction opposite to that in which the helicopter is moving.

**Retreating blade stall.** The stall of a helicopter rotor disc that occurs near the tip of the retreating blade. A retreating blade stall occurs when the flight airspeed is high and the retreating blade airspeed is low. This results in a high angle of attack, causing the stall.

**Return manifold.** The portion of a fluid power system through which the fluid is returned to the reservoir.

**Reverse polarity welding.** DC-electric arc welding in which the electrode is positive with respect to the work.

**Rib thread.** A series of circumferential grooves cut into the tread of a tire. This tread pattern provides superior traction and directional stability on hard-surfaced runways.

**Ribbon direction.** The direction in a piece of honeycomb material that is parallel to the length of the strips of material that make up the core.

**Rigid conduit.** Aluminum alloy tubing used to house electrical wires in areas where they are subject to mechanical damage.

**Rigidity in space.** The characteristic of a gyroscope that prevents its axis of rotation tilting as the earth rotates. This characteristic is used for attitude gyro instruments.

**Rime ice.** A rough ice that forms on aircraft flying through visible moisture, such as a cloud, when the temperature is below freezing. Rime ice disturbs the smooth airflow as well as adding weight.

**Rivet cutters.** Special cutting pliers that resemble diagonal cutters except that the jaws are ground in such a way that they cut the rivet shank, or stem, off square.

**Rivet set.** A tool used to drive aircraft solid rivets. It is a piece of hardened steel with a recess the shape of the rivet head in one end. The other end fits into the rivet gun.

**RMI.** Radio magnetic indicator.

**Rocking shaft.** A shaft used in the mechanism of a pressure measuring instrument to change the direction of movement by 90° and to amplify the amount of movement.

**Roll (aircraft maneuver).** Rotation of an aircraft about its longitudinal axis.

**Roots-type air compressor.** A positive-displacement air pump that uses two intermeshing figure-8-shaped rotors to move the air.

**Rosette weld.** A method of securing one metal tube inside another by welding. Small holes are drilled in the outer tube and the inner tube is welded to it around the circumference of the holes.

**Rotary actuator.** A fluid power actuator whose output is rotational. A hydraulic motor is a rotary actuator.

**Roving.** A lightly twisted roll or strand of fibers.

**RPM.** Revolutions per minute.

**Ruddervators.** The two movable surfaces on a V-tail empennage. When these two surfaces are moved together with the in-and-out movement of the control yoke, they act as elevators, and when they are moved differentially with the rudder pedals, they act as the rudder.

**Saddle gusset.** A piece of plywood glued to an aircraft structural member. The saddle gusset has a cutout to hold a backing block or strip tightly against the skin to allow a nailing strip to be used to apply pressure to a glued joint in the skin.

**Sailplane.** A high-performance glider.

**Sandwich material.** A type of composite structural material in which a core material is bonded between face sheets of metal or resin-impregnated fabric.

**Satin-weave fabric.** Fabric in which the warp threads pass under one fill thread and over several others. Satin-weave fabrics are used when the lay-up must be made over complex shapes.

**Scarf joint.** A joint in a wood structure in which the ends to be joined are cut in a long taper, normally about 12:1, and fastened together by gluing. A glued scarf joint makes a strong splice because the joint is made along the side of the wood fibers rather than along their ends.

**Schematic diagram.** A diagram of an electrical system in which the system components are represented by symbols rather than drawings or pictures of the actual devices.

**Schrader valve.** A type of service valve used in an air conditioning system. This is a spring-loaded valve much like the valve used to put air into a tire.

**Scissors.** A name commonly used for torque links. See torque links.

**Scupper.** A recess around the filler neck of an aircraft fuel tank. Any fuel spilled when the tank is being serviced collects in the scupper and drains to the ground through a drain line rather than flowing into the aircraft structure.

**Sea level engine.** A reciprocating engine whose rated takeoff power can be produced only at sea level.

**Sector gear.** A part of a gear wheel containing the hub and a portion of the rim with teeth.

**Series circuit.** A method of connecting electrical components in such a way that all the current flows through each of the components. There is only one path for current to flow.

**Series-parallel circuit.** An electrical circuit in which some of the components are connected in parallel and others are connected in series.

**Selcal system.** Selective calling system. Each aircraft operated by an airline is assigned a particular four-tone audio combination for identification purposes. A ground station keys the signal whenever contact with that particular aircraft is desired. The signal is decoded by the airborne selcal decoder and the crew alerted by the selcal warning system.

**Selsyn system.** A DC synchro system used in remote indicating instruments. The rotor in the indicator is a permanent magnet and the stator is a tapped toroidal coil. The transmitter is a circular potentiometer with DC power fed into its wiper which is moved by the object being monitored. The transmitter is connected to the indicator in such a way that rotation of the transmitter shaft varies the current in the sections of the indicator toroidal coil. The magnet in the indicator on which the pointer is mounted locks with the magnetic field produced by the coils and follows the rotation of the transmitter shaft.

**Segmented-rotor brake.** A heavy-duty, multiple-disk brake used on large, high-speed aircraft. Stators that are surfaced with a material that retains its friction characteristics at high temperatures are keyed to the axle. Rotors which are keyed into the wheels mesh with the stators. The rotors are made in segments to allow for cooling and for their large amounts of expansion.

**Selector valve.** A flow control valve used in hydraulic systems that directs pressurized fluid into one side of an actuator, and at the same time directs return fluid from the other side of the actuator back to the reservoir. There are two basic types of selector valves: open-center valves and closed-center valves. The four-port closed-center valve is the most frequently used type. See closed-center selector valve and open-center selector valve.

**Selvage edge.** The woven edge of fabric used to prevent the material unraveling during normal handling. The selvage edge, which runs the length of the fabric parallel to the warp threads, is usually removed from materials used in composite construction.

**Semiconductor diode.** A two-element electrical component that allows current to pass through it in one direction, but blocks its passage in the opposite direction. A diode acts in an electrical system in the same way a check valve acts in a hydraulic system.

**Semimonocoque structure.** A form of aircraft stressed skin structure. Most of the strength of a semimonocoque structure is in the skin, but the skin is supported on a substructure of formers and stringers that give the skin its shape and increase its rigidity.

**Sensible heat.** Heat that is added to a liquid causing a change in its temperature but not its physical state.

**Sensitivity.** A measure of the signal strength needed to produce a distortion-free output in a radio receiver.

**Sequence valve.** A valve in a hydraulic system that requires a certain action to be completed before another action can begin. Sequence valves are used to assure that the hydraulically actuated wheel-well doors are completely open before pressure is directed to the landing gear to lower it.

**Servo.** An electrical or hydraulic actuator connected into a flight control system. A small force on the flight deck control is amplified by the servo and provides a large force to move the control surface.

**Servo amplifier.** An electronic amplifier in an autopilot system that increases the signal from the autopilot enough that it can operate the servos that move the control surfaces.

**Servo tab.** A small movable tab built into the trailing edge of a primary control surface of an airplane. The flight deck controls move the tab in such a direction that it produces an aerodynamic force moving the surface on which it is mounted.

**Setback.** The distance the jaws of a brake must be set back from the mold line to form a bend. Setback for a 90° bend is equal to the inside radius of the bend plus the thickness of the metal being bent. For a bend other than 90°, a K-factor must be used. See also K-factor.

**Shake (wood defect).** Longitudinal cracks in a piece of wood, usually between two annual rings.

**SHF.** Super-high frequency.

**Shear section.** A necked-down section of the drive shaft of a constant-displacement engine-driven fluid pump. If the pump should seize, the shear section will break and prevent the pump from being destroyed or the engine from being damaged. Some pumps use a shear pin rather than a shear section.

**Shear strength.** The strength of a riveted joint in a sheet metal structure in which the rivets shear before the metal tears at the rivet holes.

**Shelf life.** The length of time a product is good when it remains in its original unopened container.

**Shielded wire.** Electrical wire enclosed in a braided metal jacket. Electromagnetic energy radiated from the wire is trapped by the braid and is carried to ground.

**Shimmy.** Abnormal, and often violent, vibration of the nose wheel of an airplane. Shimmying is usually caused by looseness of the nose wheel support mechanism or an unbalanced wheel.

**Shimmy damper.** A small hydraulic shock absorber installed between the nose wheel fork and the nose wheel cylinder attached to the aircraft structure.

**Shock mounts.** Resilient mounting pads used to protect electronic equipment by absorbing low-frequency, high amplitude vibrations.

**Shock wave.** A pressure wave formed in the air by a flight vehicle moving at a speed greater than the speed of sound. As the vehicle passes through the air, it produces sound waves that spread out in all directions. But since the vehicle is flying faster than these waves are moving, they build up and form a pressure wave at the front and rear of the vehicle. As the air passes through a shock wave it slows down, its static pressure increases, and its total energy decreases.

**Shop head.** The head of a rivet which is formed when the shank is upset.

**Show-type finish.** The type of finish put on fabric-covered aircraft intended for show. This finish is usually made up of many coats of dope, with much sanding and rubbing of the surface between coats.

**Shunt winding.** Field coils in an electric motor or generator that are connected in parallel with the armature.

**Shuttle valve.** An automatic selector valve mounted on critical components such as landing gear actuation cylinders and brake cylinders. For normal operation, system fluid flows into the actuator through the shuttle valve, but if normal system pressure is lost, emergency system pressure forces the shuttle over and emergency fluid flows into the actuator.

**Sidestick controller.** A flight deck flight control used on some of the fly-by-wire equipped airplanes. The stick is mounted rigidly on the side console of the flight deck, and pressures exerted on the stick by the pilot produce electrical signals that are sent to the computer that flies the airplane.

**Sight glass (air conditioning system component).** A small window in the high side of a vapor-cycle cooling system. Liquid refrigerant flows past the sight glass, and if the charge of refrigerant is low, bubbles will be seen. A fully charged system has no bubbles in the refrigerant.

**Sight line.** A line drawn on a sheet metal layout that is one bend radius from the bend-tangent line. The sight line is lined up directly below the nose of the radius bar in a cornice brake. When the metal is clamped in this position, the bend tangent line is in the correct position for the start of the bend.

**Silicon controlled rectifier (SCR).** A semiconductor electron control device. An SCR blocks current flow in both directions until a pulse of positive voltage is applied to its gate. It then conducts in its forward direction, while continuing to block current in its reverse direction.

**Silicone rubber.** An elastomeric material made from silicone elastomers. Silicone rubber is compatible with fluids that attack other natural or synthetic rubbers.

**Single-acting actuator.** A linear hydraulic or pneumatic actuator that uses fluid power for movement in one direction and a spring force for its return.

**Single-action hand pump.** A hand-operated fluid pump that moves fluid only during one stroke of the pump handle. One stroke pulls the fluid into the pump and the other forces the fluid out.

**Single-disk brakes.** Aircraft brakes in which a single steel disk rotates with the wheel between two brake-lining blocks. When the brake is applied, the disk is clamped tightly between the lining blocks, and the friction slows the aircraft.

**Single-servo brakes.** Brakes that uses the momentum of the aircraft rolling forward to help apply the brakes by wedging the brake shoe against the brake drum.

**Sintered metal.** A porous material made by fusing powdered metal under heat and pressure.

**Skydrol hydraulic fluid.** The registered trade name for a synthetic, nonflammable, phosphate ester-base hydraulic fluid used in modern high-temperature hydraulic systems.

**Slat.** A secondary control on an aircraft that allows it to fly at a high angle of attack without stalling. A slat is a section of leading edge of wing mounted on curved tracks that move into and out of the wing on rollers.

**Slip roll former.** A shop tool used to form large radius curves on sheet metal.

**Slippage mark.** A paint mark extending across the edge of an aircraft wheel onto a tube-type tire. When this mark is broken, it indicates the tire has slipped on the wheel, and there is a good reason to believe the tube has been damaged.

**Slipstream area.** For the purpose of rib stitch spacing, the slipstream area is considered to be the diameter of the propeller plus one wing rib on each side.

**Slot (aerodynamic device).** A fixed, nozzle-like opening near the leading edge of an airplane wing ahead of the aileron. A slot acts as a duct to force high-energy air down on the upper surface of the wing when the airplane is flying at a high angle of attack. The slot, which is located ahead of the aileron, causes the inboard portion of the wing to stall first, allowing the aileron to remain effective throughout the stall.

**Slow-blow fuse.** An electrical fuse that allows a large amount of current to flow for a short length of time but melts to open the circuit if more than its rated current flows for a longer period.

**Smoke detector.** A device that warns the flight crew of the presence of smoke in cargo and/or baggage compartments. Some smoke detectors are of the visual type, others are photoelectric or ionization devices.

**Snubber.** A device in a hydraulic or pneumatic component that absorbs shock and/or vibration. A snubber is installed in the line to a hydraulic pressure gauge to prevent the pointer fluctuating.



**Softwood.** Wood from a tree that bears cones and has needles rather than leaves.

**Soldering.** A method of thermally joining metal parts with a molten nonferrous alloy that melts at a temperature below 800 °F. The molten alloy is pulled up between close-fitting parts by capillary action. When the alloy cools and hardens, it forms a strong, leak-proof connection.

**Solenoid.** An electrical component using a small amount of current flowing through a coil to produce a magnetic force that pulls an iron core into the center of the coil. The core may be attached to a set of heavy-duty electrical contacts, or it may be used to move a valve or other mechanical device.

**Solidity (helicopter rotor characteristic).** The solidity of a helicopter rotor system is the ratio of the total blade area to the disc area.

**Solution heat treatment.** A type of heat treatment in which the metal is heated in a furnace until it has a uniform temperature throughout. It is then removed and quenched in cold water. When the metal is hot, the alloying elements enter into a solid solution with the base metal to become part of its basic structure. When the metal is quenched, these elements are locked into place.

**Sonic venture.** A venture in a line between a turbine engine or turbocharger and a pressurization system. When the air flowing through the venture reaches the speed of sound, a shock wave forms across the throat of the venture and limits the flow. A sonic venture is also called a flow limiter.

**Specific heat.** The number of BTUs of heat energy needed to change the temperature of one pound of a substance 1 °F.

**Speed brakes.** A secondary control of an airplane that produces drag without causing a change in the pitch attitude of the airplane. Speed brakes allow an airplane to make a steep descent without building up excessive forward airspeed.

**Spike knot.** A knot that runs through the depth of a beam perpendicular to the annual rings. Spike knots appear most frequently in quartersawed wood.

**Spin.** A flight maneuver in which an airplane descends in a corkscrew fashion. One wing is stalled and the other is producing lift.

**Spirit level.** A curved glass tube partially filled with a liquid, but with a bubble in it. When the device in which the tube is mounted is level, the bubble will be in the center of the tube.

**Splayed patch (wood structure repair).** A type of patch made in an aircraft plywood structure in which the edges of the patch are tapered for approximately five times the thickness of the plywood. A splayed patch is not recommended for use on plywood less than 1/10 inch thick.

**Split bus.** A type of electrical bus that allows all of the voltage-sensitive avionic equipment to be isolated from the rest of the aircraft electrical system when the engine is being started or when the ground-power unit is connected.

**Split-rocker switch.** An electrical switch whose operating rocker is split so one half of the switch can be opened without affecting the other half. Split-rocker switches are used as aircraft master switches. The battery can be turned on without turning on the alternator, but the alternator cannot be turned on without also turning on the battery. The alternator can be turned off without turning off the battery, but the battery cannot be turned off without also turning off the alternator.

**Split (wood defect).** A longitudinal crack in a piece of wood caused by externally induced stress.

**Spoilers.** Flight controls that are raised up from the upper surface of a wing to destroy, or spoil, lift. Flight spoilers are used in conjunction with the ailerons to decrease lift and increase drag on the descending wing. Ground spoilers are used to produce a great amount of drag to slow the airplane on its landing roll.

**Spongy brakes.** Hydraulic brakes whose pedal has a spongy feel because of air trapped in the fluid.

**Spontaneous combustion.** Self-ignition of a material caused by heat produced in the material as it combines with oxygen from the air.

**Springwood.** The portion of an annual ring in a piece of wood formed principally during the first part of the growing season, the spring of the year. Springwood is softer, more porous, and lighter than the summerwood.

**Square.** A four-sided plane figure whose sides are all the same length, whose opposite sides are parallel, and whose angles are all right angles.

**Squat switch.** An electrical switch actuated by the landing gear scissors on the oleo strut. When no weight is on the landing gear, the oleo piston is extended and the switch is in one position, but when weight is on the gear, the oleo strut compresses and the switch changes its position. Squat switches are used in antiskid brake systems, landing gear safety circuits, and cabin pressurization systems.

**Squib.** An explosive device in the discharge valve of a high-rate-discharge container of fire-extinguishing agent. The squib drives a cutter into the seal in the container to discharge the agent.

**SRM.** Structural Repair Manual.

**Stabilator.** A flight control on the empennage of an airplane that acts as both a stabilizer and an elevator. The entire horizontal tail surface pivots and is moved as a unit.

**Stability.** The characteristic of an aircraft that causes it to return to its original flight condition after it has been disturbed.

**Stabilons.** Small wing-like horizontal surfaces mounted on the aft fuselage to improve longitudinal stability of airplanes that have an exceptionally wide center of gravity range.

**Stagnation point.** The point on the leading edge of a wing at which the airflow separates, with some flowing over the top of the wing and the rest below the wing.

**Stall.** A flight condition in which an angle of attack is reached at which the air ceases to flow smoothly over the upper surface of an airfoil. The air becomes turbulent and lift is lost.

**Stall strip.** A small triangular metal strip installed along the leading edge of an airplane wing near the wing root. Stall strips cause the root section of the wing to stall before the portion of the wing ahead of the ailerons.

**Standpipe.** A pipe sticking up in a tank or reservoir that allows part of the tank to be used as a reserve, or standby, source of fluid.

**Starter-generator.** A single-component starter and generator used on many of the smaller gas-turbine engines. It is used as a starter, and when the engine is running, its circuitry is shifted so that it acts as a generator.

**Static.** Still, not moving.

**Static air pressure.** Pressure of the ambient air surrounding the aircraft. Static pressure does not take into consideration any air movement.

**Static dischargers.** Devices connected to the trailing edges of control surfaces to discharge static electricity harmlessly into the air. They discharge the static charges before they can build up high enough to cause radio receiver interference.

**Static stability.** The characteristic of an aircraft that causes it to return to straight and level flight after it has been disturbed from that condition.

**Stoddard solvent.** A petroleum product, similar to naphtha, used as a solvent and a cleaning fluid.

**STOL.** Short takeoff and landing.

**Stop drilling.** A method of stopping the growth of a crack in a piece of metal or transparent plastic by drilling a small hole at the end of the crack. The stresses are spread out all around the circumference of the hole rather than concentrated at the end of the crack.

**Straight polarity welding.** DC-electric arc welding in which the electrode is negative with respect to the work.

**Strain.** A deformation or physical change in a material caused by a stress.

**Stress.** A force set up within an object that tries to prevent an outside force from changing its shape.

**Stressed skin structure.** A type of aircraft structure in which all or most of the stresses are carried in the outside skin. A stressed skin structure has a minimum of internal structure.

**Stress riser.** A location where the cross-sectional area of the part changes abruptly. Stresses concentrate at such a location and failure is likely. A scratch, gouge, or tool mark in the surface of a highly stressed part can change the area enough to concentrate the stresses and become a stress riser.

**Stringer.** A part of an aircraft structure used to give the fuselage its shape and, in some types of structure, to provide a small part of fuselage strength. Formers give the fuselage its cross-sectional shape and stringers fill in the shape between the formers.

**Stroboscopic tachometer.** A tachometer used to measure the speed of any rotating device without physical contact. A highly accurate variable-frequency oscillator triggers a high-intensity strobe light.

**Sublimation.** A process in which a solid material changes directly into a vapor without passing through the liquid stage.

**Subsonic flight.** Flight at an airspeed in which all air flowing over the aircraft is moving at a speed below the speed of sound.

**Summerwood.** The less porous, usually harder portion of an annual ring that forms in the latter part of the growing season, the summer of the year.

**Sump.** A low point in an aircraft fuel tank in which water and other contaminants can collect and be held until they can be drained out.

**Supercooled water.** Water in its liquid form at a temperature well below its natural freezing temperature. When supercooled water is disturbed, it immediately freezes.

**Superheat.** Heat energy that is added to a refrigerant after it changes from a liquid to a vapor.

**Super heterodyne circuit.** A sensitive radio receiver circuit in which a local oscillator produces a frequency that is a specific difference from the received signal frequency. The desired signal and the output from the oscillator are mixed, and they produce a single, constant intermediate frequency. This IF is amplified, demodulated, and detected to produce the audio frequency that is used to drive the speaker.

**Supersonic flight.** Flight at an airspeed in which all air flowing over the aircraft is moving at a speed greater than the speed of sound.

**Supplemental Type Certificate (STC).** An approval issued by the FAA for a modification to a type certificated airframe, engine, or component. More than one STC can be issued for the same basic alteration, but each holder must prove to the FAA that the alteration meets all the requirements of the original type certificate.

**Surface tape.** Strips of aircraft fabric that are doped over all seams and places where the fabric is stitched to the aircraft structure. Surface tape is also doped over the wing leading edges where abrasive wear occurs. The edges of surface tape are pink, or notched, to keep them from raveling before the dope is applied.

**Surfactant.** A surface active agent, or partially soluble contaminant, which is a by-product of fuel processing or of fuel additives. Surfactants adhere to other contaminants and cause them to drop out of the fuel and settle to the bottom of the fuel tank as sludge.

**Surveyor's transit.** An instrument consisting of a telescope mounted on a flat, graduated, circular plate on a tripod. The plate can be adjusted so it is level, and its graduations oriented to magnetic north. When an object is viewed through the telescope, its azimuth and elevation may be determined.

**Swashplate.** The component in a helicopter control system that consists basically of two bearing races with ball bearings between them. The lower, or nonrotating, race is tilted by the cyclic control, and the upper, or rotating, race has arms which connect to the control horns on the rotor blades. Movement of the cyclic pitch control is transmitted to the rotor blades through the swashplate. Movement of the collective pitch control raises or lowers the entire swashplate assembly to change the pitch of all the blades at the same time.

**Synchro system.** A remote instrument indicating system. A synchro transmitter is actuated by the device whose movement is to be measured, and it is connected electrically with wires to a synchro indicator whose pointer follows the movement of the shaft of the transmitter.

**Symmetrical airfoil.** An airfoil that has the same shape on both sides of its chord line, or center line.

**Symmetry check.** A check of an airframe to determine that the wings and tail are symmetrical about the longitudinal axis.

**System-pressure regulator (hydraulic system component).** A type of hydraulic system-pressure control valve. When the system pressure is low, as it is when some unit is actuated, the output of the constant-delivery pump is directed into the system. When the actuation is completed and the pressure builds up to a specified kick-out pressure, the pressure regulator shifts. A check valve seals the system off and the pressure is maintained by the accumulator. The pump is unloaded and its output is directed back into the reservoir with very little opposition. The pump output pressure drops, but the volume of flow remains the same. When the system pressure drops to the specified kick-in pressure, the regulator again shifts and directs fluid into the system. Spool-type and balanced-pressure-type system pressure regulators are completely automatic in their operation and require no attention on the part of the flight crew.

**TACAN (Tactical Air Navigation).** A radio navigation facility used by military aircraft for both direction and distance information. Civilian aircraft receive distance information from a TACAN on their DME.

**Tack coat.** A coat of finishing material sprayed on the surface and allowed to dry until the solvents evaporate. As soon as the solvents evaporate, a wet full-bodied coat of material is sprayed over it.

**Tack rag.** A clean, lintless rag, slightly damp with thinner. A tack rag is used to wipe a surface to prepare it to receive a coat of finishing material.

**Tack weld.** A method of holding parts together before they are permanently welded. The parts are assembled, and small spots of weld are placed at strategic locations to hold them in position.

**Tacky.** Slightly sticky to the touch.

**Tailets.** Small vertical surfaces mounted underside of the horizontal stabilizer of some airplanes to increase the directional stability.

**Takeoff warning system.** An aural warning system that provides audio warning signals when the thrust levers are advanced for takeoff if the stabilizer, flaps, or speed brakes are in an unsafe condition for takeoff.

**Tang.** A tapered shank sticking out from the blade of a knife or a file. The handle of a knife or file is mounted on the tang.

**TCAS.** Traffic Alert Collision Avoidance System.

**Teflon.** The registered trade name for a fluorocarbon resin used to make hydraulic and pneumatic seals, hoses, and backup rings.

**Tempered glass.** Glass that has been heat-treated to increase its strength. Tempered glass is used in bird-proof, heated windshields for high-speed aircraft.

**Terminal strips.** A group of threaded studs mounted in a strip of insulating plastic. Electrical wires with crimped-on terminals are placed over the studs and secured with nuts.

**Terminal VOR.** A low-powered VOR that is normally located on an airport.

**Tetraethyl lead (TEL).** A heavy, oily, poisonous liquid,  $\text{Pb}(\text{C}_2\text{H}_5)_4$ , that is mixed into aviation gasoline to increase its critical pressure and temperature.

**Therapeutic mask adapter.** A calibrated orifice in the mask adapter for a continuous-flow oxygen system that increases the flow of oxygen to a mask being used by a passenger who is known to have a heart or respiratory problem.

**Thermal dimpling.** See hot dimpling.

**Thermal relief valve.** A relief valve in a hydraulic system that relieves pressure that builds up in an isolated part of the system because of heat. Thermal relief valves are set at a higher pressure than the system pressure relief valve.

**Thermistor.** A special form of electrical resistor whose resistance varies with its temperature.

**Thermistor material.** A material with a negative temperature coefficient that causes its resistance to decrease as its temperature increases.

**Thermocouple.** A loop consisting of two kinds of wire, joined at the hot, or measuring, junction and at the cold junction in the instrument. The voltage difference between the two junctions is proportional to the temperature difference between the junctions. In order for the current to be meaningful, the resistance of the thermocouple is critical, and the leads are designed for a specific installation. Their length should not be altered. Thermocouples used to measure cylinder head temperature are usually made of iron and constantan, and thermocouples that measure exhaust gas temperature for turbine engines are made of chromel and alumel.

**Thermocouple fire-detection system.** A fire-detection system that works on the principle of the rate-of-temperature rise. Thermocouples are installed around the area to be protected, and one thermocouple is surrounded by thermal insulation that prevents its temperature changing rapidly. In the event of a fire, the temperature of all the thermocouples except the protected one will rise immediately and a fire warning will be initiated. In the case of a general overheat condition, the temperature of all the thermocouples will rise uniformly and there will be no fire warning.

**Thermoplastic resin.** A type of plastic material that becomes soft when heated and hardens when cooled.

**Thermosetting resin.** A type of plastic material that, when once hardened by heat, cannot be softened by being heated again.

**Thermostatic expansion valve (TEV).** The component in a vapor-cycle cooling system that meters the refrigerant into the evaporator. The amount of refrigerant metered by the TEV is determined by the temperature and pressure of the refrigerant as it leaves the evaporator coils. The TEV changes the refrigerant from a high-pressure liquid into a low-pressure liquid.

**Thixotropic agents.** Materials, such as microballoons, added to a resin to give it body and increase its workability.

**TIG welding.** Tungsten inert welding is a form of electric arc welding in which the electrode is a nonconsumable tungsten wire. TIG welding is now called GTA (gas tungsten arc) welding.

**Toe-in.** A condition of landing gear alignment in which the front of the tires are closer together than the rear. When the aircraft rolls forward, the wheels try to move closer together.

**Toe-out.** A condition of landing gear alignment in which the front of the tires are further apart than the rear. When the aircraft rolls forward, the wheels try to move farther apart.

**Torque.** A force that produces or tries to produce rotation.

**Torque links.** The hinged link between the piston and cylinder of an oleo-type landing gear shock absorber. The torque links allow the piston to move freely in and out of the landing gear cylinder, but prevent it rotating. The torque links can be adjusted to achieve and maintain the correct wheel alignment. Torque links are also called scissors and nutcrackers.

**Torque tube.** A tube in an aircraft control system that transmits a torsional force from the operating control to the control surface.

**Torsion rod.** A device in a spring tab to which the control horn is attached. For normal operation, the torsion rod acts as a fixed attachment point, but when the control surface loads are high, the torsion rod twists and allows the control horn to deflect the spring tab.

**Total air pressure.** The pressure a column of moving air will have if it is stopped.

**TMC.** Thrust management computer.

**Toroidal coil.** An electrical coil wound around a ring-shaped core of highly permeable material.

**Total air temperature.** The temperature a column of moving air will have if it is stopped.

**TR unit.** A transformer-rectifier unit. A TR unit reduces the voltage of AC and changes it into DC.

**Tractor powerplant.** An airplane powerplant in which the propeller is mounted in the front, and its thrust pulls the airplane rather than pushes it.

**Trammel (verb).** To square up the Pratt truss used in an airplane wing. Trammel points are set on the trammel bar so they measure the distance between the center of the front spar, at the inboard compression strut, and at the center of the rear spar at the next compression strut outboard. The drag and antidrug wires are adjusted until the distance between the center of the rear spar at the inboard compression strut and the center of the front spar at the next outboard compression strut is exactly the same as that between the first points measured.

**Trammel bar.** A wood or metal bar on which trammel points are mounted to compare distances.

**Trammel points.** A set of sharp-pointed pins that protrude from the sides of a trammel bar.

**Transducer.** A device that changes energy from one form to another. Commonly used transducers change mechanical movement or pressures into electrical signals.

**Transformer rectifier.** A component in a large aircraft electrical system used to reduce the AC voltage and change it into DC for charging the battery and for operating DC equipment in the aircraft.

**Translational lift.** The additional lift produced by a helicopter rotor as the helicopter changes from hovering to forward flight.

**Transonic flight.** Flight at an airspeed in which some air flowing over the aircraft is moving at a speed below the speed of sound, and other air is moving at a speed greater than the speed of sound.

**Transverse pitch.** See gauge.

**Triangle.** A three-sided, closed plane figure. The sum of the three angles in a triangle is always equal to 180°.

**Tricresyl phosphate (TCP).** A chemical compound,  $(\text{CH}_3\text{C}_6\text{H}_4\text{O})^3\text{PO}$ , used in aviation gasoline to assist in scavenging the lead deposits left from the tetraethyl lead.

**Trim tab.** A small control tab mounted on the trailing edge of a movable control surface. The tab may be adjusted to provide an aerodynamic force to hold the surface on which it is mounted deflected in order to trim the airplane for hands-off flight at a specified airspeed.

**Trimmed flight.** A flight condition in which the aerodynamic forces acting on the control surfaces are balanced and the aircraft is able to fly straight and level with no control input.

**Trip-free circuit breaker.** A circuit breaker that opens a circuit any time an excessive amount of current flows, regardless of the position of the circuit breaker's operating handle.

**Troubleshooting.** A procedure used in aircraft maintenance in which the operation of a malfunctioning system is analyzed to find the reason for the malfunction and to find a method for returning the system to its condition of normal operation.

**True airspeed (TAS).** Airspeed shown on the airspeed indicator (indicated airspeed) corrected for position error and nonstandard air temperature and pressure.

**Trunnion.** Projections from the cylinder of a retractable landing gear strut about which the strut pivots retract.

**Truss-type structure.** A type of structure made up of longitudinal beams and cross braces. Compression loads between the main beams are carried by rigid cross braces. Tension loads are carried by stays, or wires, that go from one main beam to the other and cross between the cross braces.

**Turbine.** A rotary device actuated by impulse or reaction of a fluid flowing through vanes or blades that are arranged around a central shaft.

**Turn and slip indicator.** A rate gyroscopic flight instrument that gives the pilot an indication of the rate of rotation of the aircraft about its vertical axis. A ball in a curved glass tube shows the pilot the relationship between the centrifugal force and the force of gravity. This indicates whether or not the angle of bank is proper for the rate of turn. The turn and slip indicator shows the trim condition of the aircraft and serves as an emergency source of bank information in case the attitude gyro fails. Turn and slip indicators were formerly called needle and ball and turn and bank indicators.

**Turnbuckle.** A component in an aircraft control system used to adjust cable tension. A turnbuckle consists of a brass tubular barrel with right-hand threads in one end and left-hand in the other end. Control cable terminals screw into the two ends of the barrel, and turning the barrel pulls the terminals together, shortening the cable.

**Twist drill.** A metal cutting tool turned in a drill press or handheld drill motor. A twist drill has a straight shank and spiraled flutes. The cutting edge is ground on the end of the spiraled flutes.

**Twist rope.** A stripe of paint on flexible hose that runs the length of the hose. If this stripe spirals around the hose after it is installed, it indicates the hose was twisted when it was installed. Twist stripes are also called lay lines.

**Two-terminal spot-type fire detection system.** A fire detection system that uses individual thermostats installed around the inside of the area to be protected. These thermostats are wired in parallel between two separate circuits. A short or an open circuit can exist in either circuit without causing a fire warning.

**Type Certificate Data Sheets (TCDS).** The official specifications of an aircraft, engine, or propeller issued by the Federal Aviation Administration. The TCDS lists pertinent specifications for the device, and it is the responsibility of the mechanic and/or inspector to ensure, on each inspection, that the device meets these specifications.

**UHF.** Ultrahigh frequency.

**Ultimate tensile strength.** The tensile strength required to cause a material to break or to continue to deform under a decreasing load.

**Ultraviolet-blocking dope.** Dope that contains aluminum powder or some other pigment that blocks the passage of ultraviolet rays of the sun. The coat of dope protects the organic fabrics and clear dope from deterioration by these rays.

**Undamped oscillation.** Oscillation that continues with an unchanging amplitude once it has started.

**Underslung rotor.** A helicopter rotor whose center of gravity is below the point at which it is attached to the mast.

**Unidirectional fabric.** Fabric in which all the threads run in the same direction. These threads are often bound with a few fibers run at right angles, just enough to hold the yarns together and prevent their bunching.

**Unloading valve.** This is another name for system pressure regulator. See system pressure regulator.

**Utility finish.** The finish of an aircraft that gives the necessary tautness and fill to the fabric and the necessary protection to the metal, but does not have the glossy appearance of a show-type finish.

**Vapor lock.** A condition in which vapors form in the fuel lines and block the flow of fuel to the carburetor.

**Vapor pressure.** The pressure of the vapor above a liquid needed to prevent the liquid evaporating. Vapor pressure is always specified at a specific temperature.

**Variable displacement pump.** A fluid pump whose output is controlled by the demands of the system. These pumps normally have a built-in system pressure regulator. When the demands of the system are low, the pump moves very little fluid, but when the demands are high, the pump moves a lot of fluid. Most variable displacement pumps used in aircraft hydraulic systems are piston-type pumps.

**Varnish (aircraft finishing material).** A material used to produce an attractive and protective coating on wood or metal. Varnish is made of a resin dissolved in a solvent and thinned until it has the proper viscosity to spray or brush. The varnish is spread evenly over the surface to be coated, and when the solvents evaporate, a tough film is left.

**Varsol.** A petroleum product similar to naphtha used as a solvent and cleaning fluid.

**Veneer.** Thin sheets of wood “peeled” from a log. A wide-blade knife held against the surface of the log peels away the veneer as the log is rotated in the cutter. Veneer is used for making plywood. Several sheets of veneer are glued together, with the grain of each sheet placed at 45° or 90° to the grain of the sheets next to it.

**Vertical axis.** An imaginary line, passing vertically through the center of gravity of an airplane.

**Vertical fin.** The fixed vertical surface in the empennage of an airplane. The vertical fin acts as a weathervane to give the airplane directional stability.

**VFR.** Visual flight rules.

**VHF.** Very high frequency.

**Vibrator-type voltage regulator.** A type of voltage regulator used with a generator or alternator that intermittently places a resistance in the field circuit to control the voltage. A set of vibrating contacts puts the resistor in the circuit and takes it out several times a second.

**Viscosity.** The resistance of a fluid to flow. Viscosity refers to the “stiffness” of the fluid, or its internal friction.

**Viscosity cup.** A specially shaped cup with an accurately sized hole in its bottom. The cup is submerged in the liquid to completely fill it. It is then lifted from the liquid and the time in seconds is measured from the beginning of the flow through the hole until the first break in this flow. The viscosity of the liquid relates to this time.

**Vixen file.** A metal-cutting hand file that has curved teeth across its faces. Vixen files are used to remove large amounts of soft metal.

**V<sub>NE</sub>.** Never-exceed speed. The maximum speed the aircraft is allowed to attain in any conditions of flight.

**Volatile liquid.** A liquid that easily changes into a vapor.

**Voltmeter multiplier.** A precision resistor in series with a voltmeter mechanism used to extend the range of the basic meter or to allow a single meter to measure several ranges of voltage.

**VOR.** Very high frequency Omni Range navigation.

**VORTAC.** An electronic navigation system that contains both a VOR and a TACAN facility.

**Vortex (plural vortices).** A whirling motion in a fluid.

**Vortex generator.** Small, low-aspect-ratio airfoils installed in pairs on the upper surface of a wing, on both sides of the vertical fin just ahead of the rudder, and on the underside of the vertical stabilizers of some airplanes. Their function is to pull high-energy air down to the surface to energize the boundary layer and prevent airflow separation until the surface reaches a higher angle of attack.

**Warp clock.** An alignment indicator included in a structural repair manual to show the orientation of the piles of a composite material. The ply direction is shown in relation to a reference direction.

**Warp threads.** Threads that run the length of the roll of fabric, parallel to the selvage edge. Warp threads are often stronger than fill threads.

**Warp tracers.** Threads of a different color from the warp threads that are woven into a material to identify the direction of the warp threads.

**Wash in.** A twist in an airplane wing that increases its angle of incidence near the tip.

**Wash out.** A twist in an airplane wing that decreases its angle of incidence near the tip.

**Watt.** The basic unit of electrical power. One watt is equal to  $\frac{1}{746}$  horsepower.

**Way point.** A phantom location created in certain electronic navigation systems by measuring direction and distance from a VORTAC station or by latitude and longitude coordinates from Loran or GPS.

**Web of a spar.** The part of a spar between the caps.

**Weft threads.** See fill threads.

**Wet-type vacuum pump.** An engine-driven air pump that uses steel vanes. These pumps are lubricated by engine oil drawn in through holes in the pump base. The oil passes through the pump and is exhausted with the air. Wet-type pumps must have oil separators in their discharge line to trap the oil and return it to the engine crankcase.

**Wing fences.** Vertical vanes that extend chordwise across the upper surface of an airplane wing to prevent spanwise airflow.

**Wing heavy.** An out-of-trim flight condition in which an airplane flies hands off, with one wing low.

**Wire bundle.** A compact group of electrical wires held together with special wrapping devices or with waxed string. These bundles are secured to the aircraft structure with special clamps.

**Woof threads.** See fill threads.

**Work.** The product of force times distance.

**Yaw.** Rotation of an aircraft about its vertical axis.

**Yaw damper.** An automatic flight control system that counteracts the rolling and yawing produced by Dutch roll. See Dutch roll. A yaw damper senses yaw with a rate gyro and moves the rudder an amount proportional to the rate of yaw, but in the opposite direction.

**Yield strength.** The amount of stress needed to permanently deform a material.

**Zener diode.** A special type of solid-state diode designed to have a specific breakdown voltage and to operate with current flowing through it in its reverse direction.

**Zeppelin.** The name of large, rigid, lighter-than-air ships built by the Zeppelin Company in Germany prior to and during World War I.

**Zero-center ammeter.** An ammeter in a light aircraft electrical system located between the battery and the main bus. This ammeter shows the current flowing into or out of the battery.



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